Case No. 25-10515

IN THE UNITED STATES COURT OF APPEALS
FOR THE ELEVENTH CIRCUIT

CENTER FOR BIOLOGICAL DIVERSITY,

Petitioner,

v.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY; and

LEE ZELDIN, in his official capacity as Administrator of the United States Environmental Protection Agency

Respondents.

MOSAIC FERTILIZER, LLC,

Intervenor-Respondent.

PETITIONER'S APPENDIX
VOLUME 1 OF 2

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Additional information about the Project is available from the Commission's Office of External Affairs at (866) 208–FERC or on the FERC website (*www.ferc.gov*). Using the ''eLibrary'' link, select ''General Search'' from the eLibrary menu, enter the selected date range and ''Docket Number'' excluding the last three digits (*i.e.,* CP24–494), and follow the instructions. For assistance with access to eLibrary, the helpline can be reached at (866) 208–3676, TTY (202) 502–8659, or at *FERCOnlineSupport@ferc.gov.* The eLibrary link on the FERC website also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rule makings.

Dated: October 2, 2024.

Debbie-Anne A. Reese,

Acting Secretary.

[FR Doc. 2024–23303 Filed 10–8–24; 8:45 am]

BILLING CODE 6717–01–P

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Project No. 15364–000]

Desert Bloom Energy Storage, LLC; Notice of Preliminary Permit Application Accepted for Filing and Soliciting Comments, Motions To Intervene, and Competing Applications

On June 14, 2024, Desert Bloom Energy Storage, LLC, filed an application for a preliminary permit, pursuant to section 4(f) of the Federal Power Act (FPA), proposing to study the feasibility of the Desert Bloom Energy Storage Project (Desert Bloom Project or project) to be located near the city of Las Vegas in Clark County, Nevada. The proposed project would occupy federal land managed by the Bureau of Land Management. The sole purpose of a preliminary permit, if issued, is to grant the permit holder priority to file a license application during the permit term. A preliminary permit does not authorize the permit holder to perform any land-disturbing activities or otherwise enter upon lands or waters owned by others without the owners' express permission.

The proposed project would be a closed-loop pumped storage project that would consist of the following: (1) a new upper reservoir with a maximum elevation of 4,810 feet above mean sea level (MSL), and a storage capacity of 4,900 acre-feet; (2) a new lower reservoir with a maximum elevation of 3,320 feet MSL, and a storage capacity of 4,900 acre-feet; (3) a 21-foot-diameter, 4,300-foot-long concrete and steel penstock; (4) a powerhouse with approximate dimensions of 200 feet by 100 feet and 150 feet high, and containing two vertical single-stage reversible Francis-type pump/turbine units with a total installed capacity of 450 megawatts; (5) a 132-kilovolt, 3.5-mile-long transmission line; and (6) appurtenant facilities. The water used to initially fill the reservoirs and supplement evaporative losses will either be hauled or piped in from a yet-to-be-determined source. The estimated annual generation of the Desert Bloom Project would be 1,170 gigawatt-hours.

Applicant Contact: Jonathan Blum, Desert Bloom Energy Storage, LLC; 10000 West Charleston Blvd., Suite 230, Las Vegas, Nevada 89135; (702) 910–3329.

FERC Contact: Lee Baker; email: *everard.baker@ferc.gov;* phone: (202) 502–8554.

Deadline for filing comments, motions to intervene, competing applications (without notices of intent), or notices of intent to file competing applications: 60 days from the issuance of this notice. Competing applications and notices of intent must meet the requirements of 18 CFR 4.36.

The Commission's Office of Public Participation (OPP) supports meaningful public engagement and participation in Commission proceedings. OPP can help members of the public, including landowners, environmental justice communities, Tribal members, and others, access publicly available information and navigate Commission processes. For public inquiries and assistance with filings such as interventions, comments, or requests for rehearing, the public is encouraged to contact OPP at (202) 502–6595 or *OPP@ferc.gov.*

The Commission strongly encourages electronic filing. Please file comments, motions to intervene, notices of intent, and competing applications using the Commission's eFiling system at *https://ferconline.ferc.gov/FERCOnline.aspx.* Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at *https://ferconline.ferc.gov/.aspx.* You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at *FERCOnlineSupport@ferc.gov,* (866) 208–3676 (toll free), or (202) 502–8659 (TTY). In lieu of electronic filing, you may submit a paper copy. Submissions sent via the U.S. Postal Service must be addressed to: Acting Secretary Debbie-Anne A. Reese, Federal Energy Regulatory Commission, 888 First Street NE, Washington, DC 20426. Submissions sent via any other carrier must be addressed to: Acting Secretary Debbie-Anne A. Reese, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. The first page of any filing should include docket number P–15364–000.

More information about this project, including a copy of the application, can be viewed or printed on the ''eLibrary'' link of Commission's website at *http://www.ferc.gov/docs-filing/elibrary.asp.* Enter the docket number (P–15364) in the docket number field to access the document. For assistance, contact FERC Online Support.

Dated: October 3, 2024.

Debbie-Anne A. Reese,

Acting Secretary.

[FR Doc. 2024–23385 Filed 10–8–24; 8:45 am]

BILLING CODE 6717–01–P

ENVIRONMENTAL PROTECTION AGENCY

[EPA–HQ–OAR–2024–0446; FRL–12268–01–OAR]

Notice of Pending Approval for Other Use of Phosphogypsum

AGENCY: Office of Air and Radiation, Environmental Protection Agency (EPA).

ACTION: Notice of availability.

SUMMARY: The Environmental Protection Agency (the EPA or the Agency) seeks public comment on its pending approval of a request for a ''Small-scale Road Pilot Project on Private Land in Florida'' submitted by Mosaic Fertilizer, LLC in March 2022, and updated by the ''Revised Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project'', submitted in August 2023. The Agency's review found that Mosaic's request is complete per the requirements of EPA's National Emissions Standards for Hazardous Air Pollutants under the Clean Air Act, and that the potential radiological risks from conducting the pilot project meet the regulatory requirement that the project is at least as protective of public health as maintaining the phosphogypsum in a stack. On October 9, 2024 the EPA issued a pending approval of the request subject to certain conditions. The EPA is soliciting public comments on the pending approval.

DATES: Comments may be submitted on or before November 8, 2024.

ADDRESSES: You may send comments, identified by Docket ID No. EPA–HQ–

OAR–2024–0446 by any of the following methods:

- *Federal eRulemaking Portal: https://www.regulations.gov* (our preferred method). Follow the online instructions for submitting comments.
- *Email: a-and-r-Docket@epa.gov.* Include Docket ID No. EPA–HQ–OAR–2024–0446 in the subject line of the message.
- *U.S. Postal Service Mail:* U.S. Environmental Protection Agency, EPA Docket Center, Air and Radiation Docket, Mail Code 28221T, 1200 Pennsylvania Avenue NW, Washington, DC 20460.
- *Hand Delivery/Courier:* EPA Docket Center, WJC West Building, Room 3334, 1301 Constitution Avenue NW, Washington, DC 20004. The Docket Center's hours of operations are 8:30 a.m.–4:30 p.m., Monday–Friday (except Federal holidays).

Instructions: All submissions received must include the Docket ID No. EPA–HQ–OAR–2024–0446. Comments received may be posted without change to *https://www.regulations.gov/,* including any personal information provided. For detailed instructions on sending comments, see the **SUPPLEMENTARY INFORMATION** section of this document. Copies of Mosaic's request, supporting materials, and the EPA's analysis are available on the EPA's phosphogypsum website at *https://www.epa.gov/radiation/phosphogypsum#aaup.*

FOR FURTHER INFORMATION CONTACT: Jonathan Walsh, Radiation Protection Division, Office of Radiation and Indoor Air, Mail Code 6608T, Environmental Protection Agency, 1200 Pennsylvania Avenue NW, Washington, DC 20460; 202–343–9238; *Walsh.Jonathan@epa.gov.*

SUPPLEMENTARY INFORMATION:

I. Public Participation

Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2024–0446, at *https://www.regulations.gov* (our preferred method), or the other methods identified in the **ADDRESSES** section.

Once submitted, comments cannot be edited or removed from the docket. EPA may publish any comment received to its public docket. Do not submit electronically any information you consider to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. The written comment is considered the official comment and should include discussion of all points you wish to make. The EPA generally will not consider comments or their contents located outside of the primary submission (*i.e.,* on the web, cloud, or other file sharing system). For additional submission methods, the full EPA public comment policy, information about CBI or multimedia submissions, and general guidance on making effective comments, please visit *https://www.epa.gov/dockets/commenting-epa-dockets.*

Tips for Preparing Your Comments. When submitting comments, remember to:

- Identify the notice by docket number, subject heading, **Federal Register** date, and page number.
- Provide a brief description of yourself and your role or organization.
- Explain why you agree or disagree; suggest alternatives and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- Illustrate your concerns with specific examples and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.
- Make sure to submit your comments by the comment period deadline identified.

II. Background

Phosphogypsum is the waste byproduct of wet acid phosphorous production. It contains elevated concentrations of the radionuclide radium, which decays to form radon gas. The EPA's regulations under the Clean Air Act at 40 CFR part 61, subpart R (hereafter ''Subpart R'') require that phosphogypsum must be disposed of in engineered piles, called stacks, to limit public exposure to its radioactive components. Subpart R allows the removal of phosphogypsum from stacks for outdoor agricultural purposes and indoor research and development, subject to conditions and restrictions. Any other use of phosphogypsum requires prior approval from the EPA. The EPA may approve a request for a specific use of phosphogypsum if it determines that the proposed use is at least as protective of public health as placement of phosphogypsum in a stack. The processes for requesting such an approval are described in 40 CFR 61.206.

Mosaic Fertilizer, LLC submitted a request for a Small-scale Road Pilot Project on Private Land in Florida in March 2022, and submitted a Revised Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project in August 2023. Mosaic has proposed to construct a small-scale pilot project at its New Wales facility in Polk County, Florida. Mosaic's plan is to construct four sections of test road having varying mixtures of phosphogypsum (PG) in the road base ''to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge construction'' (Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 CFR 61.206, Small-scale Road Pilot Project on Private Land in Florida, Docket #). The pilot project will be constructed in the place of an existing facility road near the phosphogypsum stack, and the study will be conducted in conjunction with researchers from the University of Florida.

The EPA has performed a complete review of Mosaic's request, documented in ''Review of the Small-scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC'' (E-Docket EPA–HQ–OAR–2024–0446). The Agency's review found that Mosaic's request is complete per the requirements of 40 CFR 61.206(b). Further, the review found that Mosaic's risk assessment is technically acceptable, and that the potential radiological risks from the proposed project meet the regulatory requirements of 40 CFR 61.206(c); that is, the project is at least as protective of public health as maintaining the phosphogypsum in a stack. Therefore, the Agency has issued a pending approval of the small-scale pilot project per 40 CFR 61.206. The pending approval is available at E-Docket EPA–HQ–OAR–2024–0446. This approval is pending a 30-day public comment period. Approval by the Agency is specific to the pilot project as described in the Mosaic request and indicates only that this project meets the approval requirements of Subpart R.

III. Request for Comments

The Agency is soliciting public comment on its pending approval. Electronic copies of the application, the EPA's review, and relevant background materials are available in the public docket [1] and on the EPA phosphogypsum website.[2] The EPA's decision to approve or deny a request for other use under 40 CFR 61.206 is not a rulemaking. In December 2005, the EPA issued a guidance document, ''Applying to EPA for Approval of Other Uses of Phosphogypsum: Preparing and Submitting a Complete Petition Under 40 CFR 61.206, A Workbook'' (December 2005). Although this guidance is not binding, the EPA is seeking public comment on this pending approval. Physical copies of the Mosaic request and the EPA's technical evaluation have been placed for public review in the Mulberry Public Library, 905 NE 5th Street, Mulberry, FL 33860.

The Agency will accept comment until November 8, 2024. Upon receipt of public comments, EPA will review all comments for their relevance to the pending design and determine if they contain information that would lead to a concern for human health or environmental impacts not previously considered. Comments must be specific to the small-scale pilot project as it is described in Mosaic's request and the EPA's pending approval. Should the EPA receive significant adverse comments on aspects of this specific pilot project, the EPA will give the applicant the opportunity to amend the analysis or request. If the comments can be successfully addressed, the EPA will publish a response to comments and notify the public. The EPA's complete process of soliciting and addressing comments is described in Section 2.4 of ''Applying to EPA for Approval of Other Uses of Phosphogypsum: Preparing and Submitting a Complete Petition Under 40 CFR 61.206, A Workbook''.

Joseph Goffman,

Assistant Administrator, Office of Air and Radiation.

[FR Doc. 2024–23294 Filed 10–8–24; 8:45 am]

BILLING CODE P

[1] Docket ID No. EPA–HQ–OAR–2024–0446.

[2] *https://www.epa.gov/radiation/phosphogypsum#aaup.*

ENVIRONMENTAL PROTECTION AGENCY

[EPA–HQ–OA–2024–0043; FRL–12321–01–OA]

National Environmental Youth Advisory Council; Notification of Public Meeting

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of meeting.

SUMMARY: Pursuant to the Federal Advisory Committee Act (FACA), the U.S. Environmental Protection Agency (EPA) hereby provides notice that the National Environmental Youth Advisory Council (NEYAC) will meet on the date and time described below. The meeting is open to the public. For additional information about registering to attend the meeting or to provide a public comment, see the ''Public Participation'' heading of the **SUPPLEMENTARY INFORMATION** section of this document. *Due to unforeseen administrative circumstances, EPA is announcing this meeting with less than 15 calendar days' notice.*

DATES: The NEYAC will convene a virtual public meeting on Tuesday, October 22, 2024. A public comment period relevant to the NEYAC will be considered by the NEYAC at the meeting (see **SUPPLEMENTARY INFORMATION**). Members of the public who wish to participate during the public comment period must register by 11:59 p.m., eastern time, Tuesday, October 15, 2024.

ADDRESSES: You may send comments, identified by Docket ID No. EPA–HQ–OA–2024–0043, by any of the following methods:

- *Federal eRulemaking Portal: https://www.regulations.gov/* (our preferred method). Follow the online instructions for submitting comments.
- *Email: neyac@epa.gov.* Include Docket ID No. EPA–HQ–OA–2024–0043 in the subject line of the message.

Instructions: All submissions received must include the Docket ID No. for this public meeting. Comments received may be posted without change to *https://www.regulations.gov/,* including any personal information provided. Comments must be submitted by 11:59 p.m. eastern time on Tuesday, November 5, 2024. For detailed instructions on sending comments and additional information on the rulemaking process, see the ''Public Participation'' heading of the **SUPPLEMENTARY INFORMATION** section of this document.

The virtual meeting will be through an online audio and video platform. The meeting will convene on Tuesday, October 22, from 12 p.m. to 4:00 p.m. eastern time. Refer to the **SUPPLEMENTARY INFORMATION** section below for additional information.

FOR FURTHER INFORMATION CONTACT: Carissa Cyran, NEYAC Designated Federal Officer (1702A), Environmental Protection Agency, 1200 Pennsylvania Ave. NW, Washington, DC 20460; telephone number: (202) 566–1353; email address: *cyran.carissa@epa.gov.* Additional information about the NEYAC is available at *https://www.epa.gov/faca/national-environmental-youth-advisory-council-neyac.*

SUPPLEMENTARY INFORMATION: The NEYAC will present the final recommendations to EPA on the topics the council has been deliberating, which include environmental justice and youth, climate change and environmental justice, and food loss and waste. EPA will also present the next set charge questions to the NEYAC. An agenda and meeting material will be posted online at *https://www.epa.gov/faca/national-environmental-youth-advisory-council-neyac-meetings.*

I. Public Participation

Individual registration is required for the public meeting. No two individuals can share the same registration link. Members of the public wishing to attend or participate virtually must contact *neyac@epa.gov* with your name, organization, city and state, and email address to receive a link to the meeting. Please also indicate whether you would like to provide public comment during the meeting, or if you are submitting written comments. Registration to attend the meeting is available until the scheduled end time of the meeting. Registration to speak during the public comment period will close at 11:59 p.m., eastern time, on Tuesday, October 15, 2024. Information on how to register is located at *https://www.epa.gov/faca/national-environmental-youth-advisory-council-neyac.*

A. Written Comments

Submit your comments, identified by Docket ID No. EPA–HQ–OA–2024–0043, at *https://www.regulations.gov* (our preferred method), or the other methods identified in the **ADDRESSES** section. Comments must be submitted by 11:59 p.m. eastern time on Tuesday, November 5, 2024. Once submitted, comments cannot be edited or removed from the docket. EPA may publish any comment received to its public docket. Do not submit to EPA's docket at *https://www.regulations.gov* any

Tab 2

ENVIRONMENTAL PROTECTION AGENCY

[FRL–12519–01–OA]

Meeting of the Local Government Advisory Committee

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notification of public meeting.

SUMMARY: Pursuant to the Federal Advisory Committee Act (FACA), the EPA hereby provides notice of a meeting of the Local Government Advisory Committee (LGAC) on the date and time described below. This meeting will be open to the public. For information on public attendance and participation, please see the registration information under **SUPPLEMENTARY INFORMATION**.

DATES: The LGAC will have a virtual meeting January 9th, from 2–3 p.m. Eastern Standard Time.

FOR FURTHER INFORMATION CONTACT: Frank Sylvester, Designated Federal Officer (DFO) of the Local Government Advisory Committee, at *sylvester.frank.j@epa.gov* or 202–564–1279.

Information on Accessibility: For information on access or services for individuals requiring accessibility accommodations, please send an email to *LGAC@epa.gov.* To request accommodation, please do so five (5) business days prior to the meeting, to give EPA as much time as possible to process your request.

SUPPLEMENTARY INFORMATION:

Content: The LGAC will discuss a welcome letter to the incoming administration, highlighting the committee's value to the Agency and where the committee can best help the Administration achieve its priorities. Meeting materials and recommendations will be posted online closer to the meeting dates.

Registration: Both meetings will be held virtually through Microsoft Teams. Members of the public who wish to participate should register by contacting Frank Sylvester, Designated Federal Officer (DFO) of the Local Government Advisory Committee, at *sylvester.frank.j@epa.gov* or 202–564–1279 at least 24 hours of the meeting start time. The agenda and other supportive meeting materials will be available online at *https://www.epa.gov/ocir/*local-government-advisory-committee-lgac and can be obtained by written request to the DFO. In the event of cancellation for unforeseen circumstances, please contact the DFO or check the website above for reschedule information.

Francis Sylvester,

Designated Federal Officer, Office of Congressional and Intergovernmental Relations.

[FR Doc. 2024–30752 Filed 12–20–24; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[EPA–HQ–OAR–2024–0446; FRL–12501–01–OAR]

Notice of Approval for Other Use of Phosphogypsum

AGENCY: Office of Air and Radiation, Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The Environmental Protection Agency (the EPA or the Agency) has approved, subject to certain conditions, the request for a ''Small-scale Road Pilot Project on Private Land in Florida'' submitted by Mosaic Fertilizer, LLC in March 2022, and updated by the ''Revised Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project'', submitted in August 2023. The Agency's review found that Mosaic's request is complete per the requirements of EPA's National Emissions Standards for Hazardous Air Pollutants under the Clean Air Act, and that the potential radiological risks from conducting the pilot project meet the regulatory requirement that the project is at least as protective of public health as maintaining the phosphogypsum in a stack. On October 9, 2024, the EPA issued a pending approval of the request and solicited public comments on the pending approval. While EPA received comments raising questions about the project, no comments were received which led EPA to change the results of its risk analyses for this proposed pilot project. This approval is only for the proposed pilot project, and EPA has placed conditions on the approval to make sure that the project remains within the scope of the application.

DATES: This decision is effective immediately.

FOR FURTHER INFORMATION CONTACT: Jonathan Walsh, Radiation Protection Division, Office of Radiation and Indoor Air, Mail Code 6608T, Environmental Protection Agency, 1200 Pennsylvania Avenue NW, Washington, DC 20460; 202–343–9238; *Walsh.Jonathan@epa.gov.*

SUPPLEMENTARY INFORMATION:

I. Background

Phosphogypsum is the waste byproduct of wet acid phosphorous production. It contains elevated concentrations of the radionuclide radium, which decays to form radon gas. The EPA's regulations under the Clean Air Act at 40 CFR part 61, subpart R (hereafter ''Subpart R'') require that phosphogypsum must be disposed of in engineered piles, called stacks, to limit public exposure to its radioactive components. Subpart R allows the removal of phosphogypsum from stacks for outdoor agricultural purposes and indoor research and development, subject to conditions and restrictions. Any other use of phosphogypsum requires prior approval from the EPA. The EPA may approve a request for a specific use of phosphogypsum if it determines that the proposed use is at least as protective of public health as placement of phosphogypsum in a stack. The processes for requesting such an approval are described in 40 CFR 61.206.

Mosaic Fertilizer, LLC submitted a request for a Small-scale Road Pilot Project on Private Land in Florida in March 2022, and submitted a Revised Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project in August 2023. Mosaic has proposed to construct a small-scale pilot project at its New Wales facility in Polk County, Florida. Mosaic's plan is to construct four sections of test road having varying mixtures of phosphogypsum (PG) in the road base ''to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge construction'' (Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 CFR 61.206, Small-scale Road Pilot Project on Private Land in Florida). The pilot project will be constructed in the place of an existing facility road near the phosphogypsum stack, and the study will be conducted in conjunction with researchers from the University of Florida.

The EPA performed a complete review of Mosaic's request, documented in ''Review of the Small-scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC'' (*www.regulations.gov,* Docket ID No. EPA–HQ–OAR–2024–0446). The Agency's review found that Mosaic's request is complete per the requirements of 40 CFR 61.206(b). Further, the review found that Mosaic's risk assessment is technically acceptable, and that the potential radiological risks from the proposed

project meet the regulatory requirements of 40 CFR 61.206(c); that is, the project is at least as protective of public health as maintaining the phosphogypsum in a stack. Therefore, the Agency issued an approval of the small-scale pilot project per 40 CFR 61.206, subject to terms and conditions which limit the project to the scope of the application. The terms and conditions are included in the approval letter to Mosaic, which is available in the public docket and on the EPA website, *https://www.epa.gov/radiation/phosphogypsum.* Approval by the Agency is specific to the pilot project as described in the Mosaic request and indicates only that this project meets the approval requirements of Subpart R.

II. Public Comments and Responses

The EPA's decision to approve or deny a request for other use under 40 CFR 61.206 is not a rulemaking. In December 2005, the EPA issued a guidance document, ''Applying to EPA for Approval of Other Uses of Phosphogypsum: Preparing and Submitting a Complete Petition Under 40 CFR 61.206, A Workbook'' (December 2005). Although this guidance is not binding, the EPA sought public comment on this pending approval using the procedure described in Section 2.4 of the Workbook. As outlined in the Workbook, the EPA published a notice of availability of this pending approval in the **Federal Register** on October 9, 2024, and opened a 30-day comment period, which was extended in response to public requests for an additional 15 days to close on November 23, 2024. Physical copies of the Mosaic request and the EPA's technical evaluation were placed for public review in the Mulberry Public Library, 905 NE 5th Street, Mulberry, FL 33860. The EPA also placed notices of public availability in local newspapers.

The EPA has reviewed all comments received for their relevance to the pending approval.

Many comments requested an extension of the 30-day comment period. The EPA extended the comment period in response to these requests.

The majority of comments were generally opposed to the use of phosphogypsum in public roads, and critical of the current state of phosphogypsum management; these comments were determined to be outside the scope of this action, which is specific to the small-scale pilot project as it is described in Mosaic's request. The EPA's approval applies only to the proposed pilot project and not any broader use. Any other use would require a separate application, risk assessment, and approval.

Comments related to EPA's management of phosphogypsum and its non-radiological contaminants under the Resource Conservation and Recovery Act and other statutes similarly fell outside the scope of the current decision. EPA has documented other regulatory issues in its supporting documents, but EPA's decision is only a determination of the permissibility of the project under the Clean Air Act National Emissions Standards for Hazardous Air Pollutants for Radionuclides. It does not imply any other regulatory approval or determinations of compliance. These must be obtained or made separately from this decision.

Some commenters indicated that EPA established a legal ban on the use of phosphogypsum in road construction by considering but not issuing a categorical approval in 1992. Road use is not prohibited by the regulation as amended in 1992 and is eligible to be considered as an ''other use.''

Commenters were critical of many aspects of the risk assessment. Commenters questioned the EPA's overall ability to perform radiological risk assessment, use of fatal radiogenic cancers as a health endpoint, selection of dose and risk coefficients, selection of models, and selection of exposure scenarios and whether current risk data was used. Specifically, several commenters believed that greater emphasis should be placed on the consideration of a future resident at the site of the pilot project. These comments represent disagreements with decisions that EPA has made in its evaluation of potential risks associated with the proposed pilot project, rather than new information that the Agency has not previously considered. After reviewing the comments, the EPA continues to believe that the risk assessments associated with this pilot project are consistent with current radiological risk assessment methodologies and precedent, and sufficient to evaluate the project per the requirements of 40 CFR 61.206. Results from multiple modeling efforts indicate that risks due to the proposed pilot project are low. EPA believes that for this existing site, it is most appropriate to consider the potential risk to site workers and the nearest residents to the site when determining whether the pilot project is as protective as leaving the phosphogypsum in the stack. No comments raised topics which EPA did not consider in its technical evaluation or lead to a concern for human health or environmental impacts not previously considered.

The Agency's response to comments document is available in the public docket [1] and on the EPA phosphogypsum website,[2] together with electronic copies of the application, the EPA's review, and relevant background materials.

Joseph Goffman,

Assistant Administrator, Office of Air and Radiation.

[FR Doc. 2024–30508 Filed 12–20–24; 8:45 am]

BILLING CODE 6560–50–P

FEDERAL COMMUNICATIONS COMMISSION

[OMB 3060–1155; FR ID 269133]

Information Collection Being Reviewed by the Federal Communications Commission

AGENCY: Federal Communications Commission.

ACTION: Notice and request for comments.

SUMMARY: As part of its continuing effort to reduce paperwork burdens, and as required by the Paperwork Reduction Act (PRA) of 1995, the Federal Communications Commission (FCC or the Commission) invites the general public and other Federal agencies to take this opportunity to comment on the following information collection. Comments are requested concerning: whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; the accuracy of the Commission's burden estimate; ways to enhance the quality, utility, and clarity of the information collected; ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology; and ways to further reduce the information collection burden on small business concerns with fewer than 25 employees.

DATES: Written PRA comments should be submitted on or before February 21, 2025. If you anticipate that you will be submitting comments, but find it difficult to do so within the period of time allowed by this notice, you should advise the contact listed below as soon as possible.

[1] *https://www.regulations.gov,* Docket ID No. EPA–HQ–OAR–2024–0446.

[2] *https://www.epa.gov/radiation/phosphogypsum#aaup.*

Tab 3

March 31, 2022

IN THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REQUEST FOR APPROVAL OF ADDITIONAL USES OF PHOSPHOGYPSUM PURSUANT TO 40 C.F.R. § 61.206

Small-scale Road Pilot Project on Private Land in Florida

Submitted by: **Mosaic Fertilizer, LLC**

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CONTENTS

This Petition and supporting risk analysis were developed to comply with requirements of the Environmental Protection Agency (EPA) regulations governing the approval of alternative uses for phosphogypsum (PG) at 40 C.F.R. Part 61 and guidance in the "Applying to EPA for Approval of Other Uses of Phosphogypsum: Preparing and Submitting a Complete Petition under 40 C.F.R. § 61.206, A Workbook" (EPA PG Workbook), and through a series of discussions with EPA staff. This Petition incorporates by reference, The Fertilizer Institute's (TFI) October 2019 Request For Approval Of Additional Uses Of Phosphogypsum Pursuant to 40 C.F.R. § 61.206 (EPA-HQ-OAR-2020-0442-0017), the April 7, 2020 Revised Request (EPA-HQ-OAR-2020-0442-0005), and the associated administrative records for these Requests and includes, Radiological Risk Review (Appendix 9), Monitoring Plan (Appendix 10), Site Map (Appendix 12), and New Wales Stack Data (Appendix 13) and any additional information EPA determines for the administrative record. The methodologies and technical evaluations were informed by this previous work and in coordination with EPA.[1]

This Petition includes the following sections:

Section	Description
Preamble	Definition of Key Terms
I	Overview
II	Petition Request
III	Benefits of Use in PG Road Construction
IV	Conclusion

This Petition is supported by the following information:

Appendix Number	Description
Appendix 1-4, 6, and 8, The Fertilizer Institute October 2019 Petition and the April 7, 2020 Revised Petition and their relevant Appendices are incorporated by reference. Mosaic was a member of the TFI member companies who submitted the October 2019 and April 7, 2020 Petitions. The risk is based on adjusting the risk calculated in October	Appendix 1 from the April 7, 2020 TFI Revised Request for Approval Of Additional Uses Of Phosphogypsum Pursuant to 40 C.F.R. § 61.206 Use in Road Construction Projects Authorized by Federal, State and Local Departments of Transportation or Public Works (April 7, 2020 TFI Revised Petition). This includes the Summary of the Risk

[1] EPA approved TFI's Petition to authorize the removal of PG for use in government road construction projects under certain conditions on October 20, 2020. *See* Notice of Approval of the Request for Other Use of Phosphogypsum by The Fertilizer Institute, 85 Fed. Reg. 66,550, 66,551 (Oct. 20, 2020). The approval was withdrawn, without prejudice, on July 7, 2021, for failure to provide specific information unrelated to the risk assessment. *See* Withdrawal of Approval for Use of Phosphogypsum in Road Construction, 86 Fed. Reg. 35,795 (Jul. 7, 2021).

2019 and April 7, 2020 Petitions to reflect the risk from exposures appropriate for this Small-Scale Mosaic Pilot Study.	Assessment and Metals Screening Report (same as October 2019 Petition submission). Appendix 2: Radiological Risk Assessment in Support of Petition for Beneficial Use of Phosphogypsum (same as October 2019 Petition submission) Appendix 3: Human Health Risk Screening for Metals and Metalloids Appendix 4 4a: Response to EPA Comments on January 16, 2020 and 4b: Responses to Second Set of USEPA Questions on March 6, 2020 – Reclaimer Appendix 6: Policy Navigation Group, Economic Analysis of Phosphogypsum Reuse (December 2019) Appendix 8: Other documents being submitted for the administrative record
Appendix 9	Mosaic Petition – Road Pilot Study – Radiological Risk Review
Appendix 10	Mosaic Petition – Monitoring Plan for the Small-Scale Pilot Road Study
Appendix 11	Site Map- Location of the Road
Appendix 12	New Wales Stack Data

DEFINITION OF KEY TERMS

The basic concepts relevant to this Petition are:

PILOT STUDY CONCEPTS

Small-scale pilot project: is the intermediate step between laboratory testing and full-scale implementation of the alternative use.[2] Because of its small size, both cost, potential doses, and risks will be lower in a small-scale study than in the full-scale implementation of the alternative use. The small-scale study is designed to simulate alternative use conditions as much as possible. At a minimum, a small-scale study will consist of a field test demonstrating

[2] EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum: Preparing and Submitting a Complete Petition Under 40 CFR 61.206: A Workbook, at 9 (2005) [hereinafter EPA PG Workbook], https://www.epa.gov/sites/default/files/2015-05/documents/wrkbk_sub-r_appl_1105.pdf.

how the proposed alternative would function and a control test to generate baseline conditions.[3]

This Petition seeks approval to perform a small-scale pilot study on land owned and controlled by Mosaic of the use of PG in road construction compared to a control area (*see* Appendix 11: Site Map- Location of the Road and Figure 1, Appendix 9: Radiological Risk Review).

The purpose of the small-scale pilot is to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge Construction.[4]

Florida road specifications. The Florida Standard Specifications for Road and Bridge Construction contain requirements governing the method or manner of performing work, quantities and qualities of materials, and labor for all Florida Department of Transportation (FDOT) contracts.[5]

RADIATION CONCEPTS

Radioactivity is a measure of the amount of gamma rays, alpha or beta particles, x-rays, or neutrons that disintegrate from a gram of the substance being measured (in our situation, in each gram of PG). The amount of radioactivity in a gram of a substance is measured in curies (Ci) or becquerels (Bq). One curie is 3.7×10^{10} radioactive decays per second, roughly the amount of decays that occur in 1 gram of radium per second. A Bq is one disintegration per second. Historically, scientists originally used units of Ci. The International System of Units (ISU) now uses Bq.

A picocurie (pCi) is one-trillionth of a curie.

1 Bq = 2.70 x 10-11 curies = 27 pCi

Many substances (often naturally occurring substances) are radioactive. Generally, the sources for this explanation include EPA, Radiation Terms and Units, available at https://www.epa.gov/radiation/radiation-terms-and-units; NRC, available at https://www.nrc.gov; MIT News, Explained: rad, rem, sieverts, becquerels A guide to terminology about radiation exposure, available at http://news.mit.edu/2011/explained-radioactivity-0328; National Aeronautics and Space Administration, Radiation Math, available at https://www.nasa.gov.

The Maximum average radium (226) concentration in the PG used in the small-scale pilot study will be 35 pCi/g or less and will be measured at the location where the PG will be removed prior to removal from the stack.

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[3] *Id.*

[4] *See* FLA. DEP'T OF TRANSP , Standard Specifications for Road & Bridge Construction 219, § 200 (Jan. 2022), https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/programmanagement/implemented/specbooks/january-2022/january2022-ebook.pdf?sfvrsn=752d1333_4.

[5] *See id.*

EXPOSURE RELATED CONCEPTS

Reasonable Maximum Exposure: An estimate of a conservative exposure case, well above the average case, that is still within the range of possible exposures.

RISK ASSESSMENT AND RISK MANAGEMENT CONCEPTS

The regulatory risk assessment process converts a dose equivalent (in millirem) into an upper bound risk (or probability) of developing fatal cancers. It is based on a regulatory assumption that the dose equivalent may cause harmful effects and as the magnitude of this dose increases or decreases, the risk increases or decreases, in direct proportion, respectively, i.e., linearly (e.g., if the dose is halved, the calculated risk is halved).

The risk assessment submitted as a component of the TFI Petition (April 7, 2020) concluded that an effective dose of 600 millirem corresponds to a risk of 3 in 10,000 (i.e., if all of the protective assumptions are valid, 3 in 10,000 people may develop a fatal cancer). The actual risk is likely to be lower.

An average Radium-226 concentration of 35 pCi/g in PG was proposed in TFI's Petition (and accepted by EPA). This concentration utilized for road construction is well below EPA's safe risk level of 3 in 10,000 and is consistent with the 2019 stack sampling and with prior sampling conducted by EPA. Specifically, the 2019 risk assessment was based on a nominal Radium-226 value of 27 pCi/g, a value based on previous work by the EPA and published information on Radium-226 levels in PG. The 2019 assessment further examined the potential dose to the most exposed receptor (RME), the road construction worker who was estimated to receive a risk of about 0.55 per 10,000 exposed from the Radium-226 in the PG used in road construction. Holding all other factors the same, the potential doses and risks to the RME arising from the use of PG in road construction were also scaled up based on relative concentrations of Radium-226 PG. For example, the 2019 risk assessment discussed the risks to a road construction worker arising from the use of PG containing 35 pCi/g of Radium-226 would be about 0.7 in 10,000 (i.e., 0.5/10,000 x 35/27), compared to the 3 in 10,000 risk level (EPA's safe level) corresponds to an average Radium-226 concentration of 148 pCi/g. Although we are not aware of any PG with average Radium-226 concentrations anywhere near 148 pCi/g, such PG could in principle be used for road construction and still achieve the EPA safe level of a risk of 3 in 10,000. Table 5.1 of the 2019 Risk Assessment and discussion on the broad sampling data demonstrates that PG taken from the stacks is not expected to exceed that limit of 35pCi/g. EPA approved the TFI Petition setting of a maximum average Radium-226 concentration of 35 pCi/g.[6]

The risk assessment for this 2022 Mosaic Petition calculates the risk of the small-scale pilot road study by adjusting the risk determined in the TFI risk assessments to account for the shorter

[6] *See* Notice of Approval of the Request for Other Use of Phosphogypsum by The Fertilizer Institute, 85 Fed. Reg. 66,550, 66,552 (Oct. 20, 2020).

duration of exposure and smaller size of the pilot study (*see* Table 1, below). The radiological risk for the 2022 Mosaic Pilot Study is likely less than 1 in 1 million (*see* Table 2, below).

Table 1 Comparison of Risk Assessment Assumptions and Pilot Study Conditions

	Assumptions in 2019 Radiological Risk Assessment	Conditions in the Pilot Study
PG in roadbed material, by weight	< 50 %	< 50 %
Ra-226 in PG	27 pCi/g (max 35 pCi/g)	<35 pCi/g (The nominal average radium concentration used in the October 2019 and April 7, 2020 TFI risk assessment). The average Radium-226 concentration in 2019 for the New Wales stack was 15pCi/g (Appendix 12). Sampling will be updated prior to removal of PG from any stack for the road project, as required by EPA regulations.
Road base	10 inches	10 inches
PG of the surface asphalt	< 2.25%	none
Thickness of surface asphalt	4-5 inches	4-5 inches
Road length	>> 1mile (5280 feet)	3 x 200 feet
Road width	48 feet (4 lanes)	24 feet (2 lanes)
Residence	> 50 feet from the road	>> 50 feet from the road

Table 2. Application of the 2019 Risk Assessment for the Pilot Road Construction Exposures

Receptors Considered	Exposure Pathways	Applicable to Pilot Road	Basis for Decision	RME Radiation Doses
Truck Driver who delivers PG for road base material to construction site	Gamma radiation	Yes	PG will need to be delivered to the test road construction site	Given the size of the proposed test road, the amount of PG that will be required is much smaller than that required for the 4-lane county road considered in the 2019 risk assessment. A truck driver would be exposed for a period of a few weeks to a month, rather than the 5 years assumed in the 2019 risk assessment, and thus, on this basis alone, the dose (and risk) to the truck driver

Receptors Considered	Exposure Pathways	Applicable to Pilot Road	Basis for Decision	RME Radiation Doses
				transporting PG for the test road would be about 1/60th of that of the dose or about 1.6 mrem for a truck driver worker who works on the Pilot Road. The unavoidable dose from natural background is about 311 mrem and the incremental dose to the RME is negligible compared to dose or risk criteria and a tiny fraction of the natural background dose.
Road Construction Worker who works on roads built exclusively with PG material	Gamma radiation and PG in dust	Yes	Workers who build the test road have potential for exposure to PG	Given the size of the proposed test road, the time to construct the test road is much smaller – a few weeks to a month, rather than the 5 years assumed for construction of the 4-lane county road considered in the 2019 risk assessment. Thus, on this basis alone, the dose (and risk) to the construction worker who works on the test road would be about 1.8 mrem (i.e., about 1/60th of that estimated for the construction worker from the 2019 risk assessment). Also, the average Radium-226 concentration measured in New Wales PG stack in 2019 was 15pCi/g (Appendix 12). The unavoidable dose from natural background is about 311 mrem and hence, he incremental dose to the RME is negligible compared to dose or risk criteria and a tiny fraction of the natural background dose.
Utility worker	Gamma radiation and PG in dust	No	The site is controlled by Mosaic and there is no public access or uncontrolled construction	Not Applicable
Road User (motorist/bicyc	Gamma radiation	No	The site is controlled by	Given the test road is on private land owned by Mosaic, no public use or

Receptors Considered	Exposure Pathways	Applicable to Pilot Road	Basis for Decision	RME Radiation Doses
list) on the PG-constructed road			Mosaic and there is no public access	exposures are expected. Consideration of other road users such as Mosaic workers traveling on the road is possible but would result in dose and exposures much less than those estimated in the 2019 risk assessment considering the PG containing portion of the road would be narrower and shorter than the road assessed in the 2019 risk assessment. The road user dose and exposures in the 2019 risk assessment were already very small, so the dose to the test road user would be negligible compared to dose or risk criteria and a tiny fraction of the natural variation in natural background dose.
Resident Living Near Road	Gamma radiation and PG in dust	No	The radiation levels from the road studied in the 2019 risk assessment decrease rapidly with increasing distance. As the site is controlled by Mosaic and there is no possibility of a residence being constructed closer in proximity than the safe distance established by the 2019 risk assessment. See, TFI April 7,	Not Applicable; the closest residence is over 3miles from the test road location.

Receptors Considered	Exposure Pathways	Applicable to Pilot Road	Basis for Decision	RME Radiation Doses
			2020, Appendix 2.	
At EPA's request, the 2019 risk assessment considered a **reclaimer** scenario, which as discussed in the Petition and the 2019 risk assessment, is not considered as a reasonable maximum exposure (RME) scenario.	Gamma exposure and radon	No	Given the size of the proposed test road and the observation that the test road will be constructed on Mosaic property, a reclaimer scenario is not reasonably plausible.	Not Applicable

I. OVERVIEW

A. INTRODUCTION

PG is a byproduct of phosphate fertilizer manufacturing. Federal regulations, promulgated initially in 1989, require, with limited exceptions, that all PG must be disposed of in stacks or backfilled in phosphate mines. 40 C.F.R. § 61.206(a). Alternative uses of PG may be approved where the EPA Assistant Administrator of the Office of Air and Radiation determines the proposed use is at least as protective of public health, in both the short and long term, as disposal in a stack or mine. 40 C.F.R. § 61.206(a)-(c). This regulatory construct has resulted in the storage of 1.7 billion tons of PG in engineered stacks and the need for new storage capacity at the rate of 46 million tons per year, consuming large quantities of land and in some cases, creating the prospect of negative environmental impacts. Local communities have expressed a desire for beneficial reuse of PG for generating economic development, making land available for other uses and mitigating aesthetic and potential environmental concerns. Meanwhile, PG is widely and safely used in other countries, with significant safe reuse reported in at least 21

countries.[7] Mosaic believes data is now available to support additional alternative uses, including large volume uses such as in road construction, landfill cover, and concrete and cement for construction. EPA's consideration and approval of additional beneficial uses would support Mosaic's sustainability goals of reducing manufacturing waste and greenhouse gas emissions, decreasing the need for virgin materials that require excavation, and potentially reducing the existence or size of stacks as other countries have done.

B. **BACKGROUND**

EPA approved The Fertilizer Institute's April 7, 2020 Revised Request under 40 C.F.R. § 61.206 for use of PG in government road construction on October 20, 2020.[8] Specifically, that approval recognized that PG suppliers may not be the end users and therefore, EPA conditioned the approval to require that the PG supplier and the end user each provide information to EPA about user location and quantity prior to removal from the stack. EPA found TFI's exposure scenarios used for the supporting risk assessment "largely consistent with the EPA's 1992 analysis, as were the overall results."[9] Further, EPA found that TFI's risk assessment "adequately demonstrate[d] that the use of [PG] in road construction will be at least as protective of human health, in the short- and long-term, as stacking."[10]

EPA's approval was challenged by various environmental groups, which also requested EPA to reconsider its approval[11] and EPA withdrew its approval on July 7, 2021.[12] EPA determined that it was premature to approve TFI's request without all of the 40 C.F.R. § 61.206(b) information requirements having been met at the time of the application.[13] EPA's withdrawal was without prejudice to a subsequent request under § 61.206(b). Mosaic's Petition for a small-scale road pilot study is such a request as it contains the information required by 40 C.F.R. § 61.206(b). EPA's approval of this Petition is the next step, necessary to ultimately demonstrate that PG can be beneficially used in Florida road construction.

II. PETITION REQUEST

[7] The Fertilizer Institute, Revised Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 CFR § 61.206: Use in Road Construction Projects Authorized by Federal, State and Local Departments of Transportation or Public Works, EPA-HQ-OAR-2020-0442-0005 (Apr. 7, 2020).
[8] EPA approved the use of PG in government road construction under specific conditions. 85 Fed. Reg. 66,550 (Oct. 20, 2020).
[9] *Id.* at 66,552.
[10] *Id.*
[11] *Ctr. for Biological Diversity v. EPA*, Case No. 20-1506 (D.C. Cir. Dec. 18, 2020). These same groups submitted, on the same day, a petition seeking EPA reconsideration ostensibly under the Clean Air Act. EPA stated that reconsideration was under its own initiative and pursuant to President Biden's Executive Order 13990 which directs agencies to examine a wide range of actions issued by the previous administration.
[12] *See* Withdrawal of Approval for Use of Phosphogypsum in Road Construction, 86 Fed. Reg. 35,795 (Jul. 7, 2021).
[13] *Id.*

A. Specific Request

This Petition requests EPA approval under 40 C.F.R. § 61.206 to remove PG from a stack for use in a small-scale pilot project conducted with the University of Florida to demonstrate the beneficial use of PG in engineered road base. Laboratory studies conducted by the University support that PG, when appropriately blended with other aggregate or cementitious materials, can meet the performance criteria for engineered road base.

Environmental testing of PG aggregate blends supports that a properly designed and constructed road will meet conventional human health risk criteria sufficient for beneficial use. EPA's approval will be the next step toward developing a safe and economic alternative use for PG.

B. Requirements

1. Components of the Petition

40 C.F.R. § 61.206(b) requires the Petition must be in writing and should address the following:

The name and address of the person(s) making the request:

Patrick Kane
VP Operations Services, North America
Mosaic Fertilizer, LLC
13830 Circa Crossing Drive
Lithia, Fl 33547

A description of the proposed use, including any handling and processing that the phosphogypsum will undergo:

This Petition seeks approval to perform a small-scale pilot study of the use of PG in road construction on land owned and controlled by Mosaic. The purpose of the small-scale pilot is to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge Construction. See, Section II for full description.

The location of each facility, including suite and/or building number, street, city, county, state, and zip code, where any use, handling, or processing of the phosphogypsum will take place:

Mosaic New Wales stack, 3095 Hwy 640 W. Mulberry, FL 33860.
See, Appendix 11 Site Map and Appendix 9, Figure 1 for aerial view of the proposed project location.

The mailing address of each facility where any use, handling, or processing of the phosphogypsum will take place, if different from paragraph (b) (3) of this section.

The quantity of phosphogypsum to be used by each facility:

Total amount of PG is estimated to be up to but not more than 500 tons.

The average concentration of Radium-226 in the phosphogypsum to be used:

2019 data for the New Wales stack shows an average of about 15 pCi/g and a maximum of about 19 pCi/g. Based on that data, we can assume the level will be below 35pCi/g. *See*, Appendix 12.

A description of any measures which will be taken to prevent the uncontrolled release of phosphogypsum into the environment:

Mosaic employees will handle all offloading of PG from the stack to trucks used to haul PG to road site. PG will be unloaded to a prepared staging area for mixing with aggregate as described in Section II and Appendix 9. All PG will be handled consistent with FDOT requirements for road construction.

An estimate of the maximum individual risk, risk distribution, and incidence associated with the proposed use, including the ultimate disposition of the phosphogypsum or any product in which the phosphogypsum is incorporated.

See Appendix 9

A description of the intended disposition of any unused phosphogypsum:

Any unused PG will be returned to the stack

The Petition must be "signed and dated by a corporate officer or public official in charge of the facility.":

See Petition, Signature page.

2. Scope of the Petition

The scope of this request is described below.

Small-scale pilot road study risk assessment.

The Petition calculates the risk of the small-scale pilot road study by adjusting the risk determined in the October 2019 and April 7, 2020 TFI risk assessments based on the shorter duration of exposure for the pilot study. Mosaic adjusted the exposure times to reflect the exposures for the Pilot Study.

3. The Reasonable Maximum Exposure (RME)

For there to be a risk, there must be exposure. EPA uses a reasonable maximum exposure (RME) metric to assess exposure risk. According to EPA, the "intent of the RME is to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures."[14] EPA guidance suggests that each exposure factor used to estimate the

[14] EPA, Risk Assessment Guidance for Superfund: Volume III - Part A, Process for Conducting Probabilistic Risk Assessment, 6-3 (2001), https://www.epa.gov/sites/default/files/2015-09/documents/rags3adt_complete.pdf; *see also id.* at 7-1 ("The RME is defined as "the maximum exposure that is reasonably expected to occur within a potentially exposed population."); Interstate Technology Regulatory Council, Decision Making at Contaminated Sites, Issues and Options in Human Health Risk Assessment at 6.1.1 (2015) [hereinafter ITRC Decision Making at

RME should be selected so that the resulting estimate of exposure is consistent with the higher end of the range of plausible exposures. [15]

A National Academy of Science (NAS) Committee reviewing EPA's regulation of technologically enhanced naturally occurring radioactive material (TENORM) recommended that "EPA should use exposure and dose risk assessments that are "reasonably realistic" in developing standards for exposure to the various types of low level naturally occurring radiation.[16] The Committee defined "reasonably realistic" as "not … intended to greatly overestimate or underestimate actual effects for the exposure situation of concern" and EPA agreed with the Committee's recommendations.[17]

The exposure calculations in the Petition use currently accepted radiation modeling methods such as RESRAD and Microshield. EPA also notes that "[i]f "high-end values are chosen for every exposure factor, then the resulting exposure estimate may no longer be consistent with the RME and may exceed the realm of possibility altogether."[18]

The use of reasonable exposure assumptions is supported by the courts, which have long held that exposure assumptions used "must bear some rational relationship" to the actual conditions, and disallowed unduly conservative approaches.[19] For example, a court rejected an EPA failure to demonstrate a rational relationship between a child that eats sludge applied to roadside cemeteries every day for a five- year period and the actual usage regulated by those assumptions.[20]

Scenario-specific exposure assumptions were selected for this analysis in accordance with USEPA guidance and methodology. The exposure assumptions are discussed in Sections II and III in the 2022 Mosaic Petition. *See* Appendix 2 and Table 1 and 2, above.

Contaminated Sites], https://projects.itrcweb.org/risk-3/#6.%20Exposure%20Assessment.htm#6.1.1_Issue_–_Justifying_Site-Specific_Exposure_Factors%3FTocPath%3D6.%2520Exposure%2520Assessment%7C6.1%2520%2520Determining%2520Appropriate%2520Exposure%2520Factors%2520%7C6.1.1%2520Issue%2520%25E2%2580%2593%2520Justifying%2520Site-Specific%2520Exposure%2520Factors%7C_____0, (citing EPA Guidance).

[15] *Id*.

[16] EPA, Report to Congress: Evaluation of Guidelines for Exposures to Technologically Enhanced Naturally Occurring Radioactive Materials, 15 (2000), https://www.epa.gov/sites/production/files/2015-04/documents/402-r-00-001.pdf (describing a National Academy of Sciences report on TENORM).

[17] *Id.*

[18] ITRC Decision Making at Contaminated Sites, *supra* note 14, at 6.1.1.

[19] *See Leather Indus. of Am. v. EPA*, 40 F.3d 392, 405 (D.C. Cir. 1994) (rejecting EPA's use of an extreme assumption of a child eating sludge applied to roadside cemeteries every day for a five-year period).

[20] *Id.*

As described, below, EPA has specifically concluded that a 3 in 10,000 cancer risk is essentially the equivalent to EPA's safe risk management level and is comparable to the existing risks from PG stacks. *See* Appendix 9.[21]

4. The Reasonable Maximum Exposure (RME)

a. **Distance from the road.** Distance from the road and duration of exposure are key considerations in calculating the total dose risk. While the RME is designed to bound these, most people would be located at greater distances and/or experience shorter durations. This is true because the road project will occur on Mosaic's New Wales mine site and there are no residences or offices located in proximity to the location of the road. Thus, actual doses for the populations would be less than those presented here.

b. **Roadbase Mix**. The study road will include an approximately 10-inch base and a 4-inch pavement top layer. PG will be incorporated into the road base materials that currently will include aggregate source materials provided by a FDOT-approved supplier, not to exceed 50% PG by mass.

These ratios are supported by technical evaluations in the previous TFI Petitions and their administrative records. Studies of the road containing PG in Polk County Florida in the 1990s found similar results. *See* TFI 2020 Petition, Appendix 4a: Response to EPA Comments on January 16, 2020. State transportation departments also approve of the range of specific design requirements for PG.

5. Exposure Analysis

The following exposure scenarios (Table 2) were previously evaluated by EPA in the 2019 TFI risk assessment, which is also relied upon in the April 7, 2020 Revised Petition:

- **Truck Driver** who delivers PG for road base material to a construction site for **5 years**;

[21] As did TFI, this Petition uses 5 x 10-7 as a conversion as set forth by the International Commission on Radiological Protection (ICRP) and is consistent with EPA risk assessment procedures. Similarly, the international community has widely adopted the International Atomic Energy Agency (IAEA) determination that 1 millisievert (1 mSv) per year is the acceptable level of radiation exposure (for example, the European Union [EU] regulations). *See* IAEA, Radiation Protection and Management of NORM Residues in the Phosphate Industry, Safety Report Series No. 78, 165 (2013). The IAEA and EU determinations are also based on recommendations from the ICRP. *See, e.g.*, ICRP, The 2007 Recommendations of the International Commission on Radiological Protection, ICRP Publication No. 103, 55, 97 (Table 5), 116 (Table 8) (March 2007). The EPA provides cancer risk factors for uniform whole-body exposures of low-dose gamma radiation to the entire population, and reports an estimated 90% confidence interval for cancer mortality of 2.8 % to 10 % per Gy (2.8×10^{-7} to 10×10^{-7} per mrem). *See* EPA, EPA Radiogenic Cancer Risk Models and Projections for the U.S. Population, EPA 402-R-11-001 (April 2011). For practical purposes for gamma radiation, 1 Gy = 1 Sv = 100 rem = 100,000 mrem. This range is essentially the same dose to risk conversion range derived by ICRP.

- **Road Construction Worker** who builds roads exclusively with PG material for **5 years**;
- **Road User** who routinely commutes on the constructed roadway by vehicle, motorcycle or bicycle for **26 years** (motorist/bicyclist was deemed most conservative);
- **Resident Living Near Road** who resides in a home located 50 feet or more from a PG roadway for **26 years**. To illustrate the amount of exposure reduction with distance, exposure to a resident who resides 20 feet from the PG roadway for **26 years** was also calculated; and
- **Utility Worker** who excavates across a PG roadway during utility maintenance projects and is exposed in a trench for **160 hours in a year**. *See* next subsection for a more detailed description. *See* Appendix 1 for details.
- **Reclaimer Scenario:** Not applicable to this Petition because PG will be remain on the New Wales facility.

These exposure scenarios were selected by TFI based on a review of prior regulatory submissions as well as discussions with EPA personnel, and the best professional judgment of the scientists assisting in the preparation of the Petition.[22] This list includes receptors added at USEPA's request during the working sessions to fully evaluate public health.

6. Converting the Use Dose to Risk

Radiation risk for cancer is calculated as the product of the RME exposure dose for each scenario and the dose to risk conversion factor. The road design features analyzed in the October 2019 and April 7, 2020 TFI Petitions, Appendix 3, Metals Screening Report, and Appendix 4a, Response to EPA Comments on January 16, 2020, were determined to represent RME for all road designs, regardless of the size of the road. That is, the radioactivity levels emitted from the road in using these design assumptions were RME assumptions and did not exceed 3 in 10,000 (Appendix 4a). Thus, the radioactivity exposure risk associated with all other road designs is less than 3 in 10,000.[23] Mosaic's small-scale study road, being only 1200 ft fully constructed, falls well within these acceptable limits. *See* Table 2 above.

7. Groundwater Exposure

[22] Arcadis (a firm specializing in design and consultancy for natural and built assets), Exponent (an engineering and scientific consulting firm), Professor Timothy G. Townsend (whose research topics include recycling of waste-to-energy ash, sustainable landfill design and operation, construction and demolition debris management, beneficial use of waste materials and sustainable materials management) and Mosaic team personnel as needed. Professor Townsend has worked extensively with the Florida Department of Environmental Protection and the Florida Department of Environment. *See* Timothy G. Townsend, *Recent and Current Projects*, https://faculty.eng.ufl.edu/timothy-townsend/research/.

[23] This is an upper bound because, among other reasons, the industry practice recommends similar ratios or less and EPA's 1992 risk assessment used 33.3 percent PG to 66.6 percent soil. *See* Appendix 2; EPA, Potential Uses of Phosphogypsum and Associated Risks, Background Information Document (May 1992) [*hereinafter* "EPA 1992 BID"], https://www.epa.gov/sites/production/files/2015-07/documents/0000055v.pdf. EPA's 1992 BID risk assessment approved the use of PG for agricultural soil amendments as safe. *See id.*

EPA performed extensive modeling of the likely migration of radionuclides from PG in 1992. EPA's risk assessment determined in the 1992 Background Information Document[24] that "no radionuclides are calculated to reach the onsite well via the groundwater pathway" nor are any "radionuclide calculated to reach the off-site river or well via groundwater." The reconstruction of the 1992 EPA assessment surface water calculations performed by SENES in 1998 confirmed EPA's results. Mosaic agrees with these prior assessments and no additional evaluation was deemed necessary. *See* Appendix 10 for a description of the groundwater monitoring plan associated with construction of the pilot road.

8. The Risk Determination and Risk Management Decision

The Petition is accompanied by a Radiological Risk Assessment (Appendix 2 and 9) and the Human Health Risk Screening for Metals and Metalloids (Appendix 3). The scope and approach to these analyses were developed based on the EPA PG Workbook, prior petitions, and a series of working meetings with EPA staff that provided the benefit of EPA input and direction on key elements of the analysis.

To assist in the risk evaluation for this Petition, Mosaic will measure the radioactivity level in the PG from the Mosaic stack used in the small-scale pilot study.

Appendix 2 contains a summary of Radium-226 concentrations from prior Petitions and the general scientific literature. Results reflect that average radiation levels from the composite samples taken from all stacks do not exceed: (a) the average concentration Radium-226 concentration of 35 pCi/g) and (b) more importantly, the 148 pCi/g Radium-226 concentration corresponds to the 3 in 10,000 risk management level that EPA has designated as safe.

Key points of the Radiological Risk Assessment (*See* Tables 1 and 2, above, and Appendix 9) demonstrate that PG can be used at a cancer risk level well below 3 in 10,000 for the small-scale pilot road construction study for the following reasons:

- All RMEs resulting from the widespread use of PG in road construction in the 2020 TFI Petition were accepted by EPA and correspond to a risk of less than the 3 in 10,000 lifetime cancer risk--the risk level that EPA has determined to be safe for alternative PG uses--and well below natural background exposure (*See* Summary Table 1, and the Petition's Risk Assessment summarizing the risks from each of the exposure scenarios calculated for this Petition).
- Most actual exposures are less than those received by the RME and hence the associated average risk would also be lower (Appendix 4a: Response to the EPA Question on January 16, 2020). For example, the risk is lower for workers who are not exposed for the same duration or as directly as the RME scenarios. The analysis also shows that the risks for the residential RME scenario are much lower than for the construction worker, truck driver, and

[24] EPA 1992 BID, *supra* note 22 at 4-31, 4-34.

road user. In each case, most of the exposed population have a dose that is lower than the RME dose (*See* Appendix 4a: Response to EPA Comments on January 16, 2020).

- The exposure and risk for a small-scale pilot study are by definition lower than the exposures and risk for use of PG in governmental roads (*See* Table 1).
- Risk from other toxic or hazardous constituents is likely to be negligible, consistent with the findings of the TFI Human Health Risk Screening for Metals and Metalloids (Appendix 3).

EPA also requested that TFI perform screening analyses of the potential impact of PG ingestion on road construction workers and potential metals leaching on ground and surface water quality. Thus, these screening assessments were performed and appear in Appendix 3.

9. Florida Beneficial Use Requirements

The Florida Department of Environmental Protection (FDEP) regulates beneficial use under Florida Administrative Code (FAC) 62-701 and Part IV of Chapter 403 Florida Statutes, Solid Waste Management Act.[25] Industrial by-products are regulated as solid waste unless otherwise exempted.[26] Industrial by-products are defined as: "[m]aterials that have a demonstrated recycling potential, can be feasibly recycled, and have been diverted or removed from the solid waste stream for sale, use, or reuse and consider such wastes as construction and demolition debris, ash residue, waste tires, used oil, and compost.[27] For FDEP approval of PG for beneficial use, Mosaic must show that the proposed use will not cause ground water or surface water contamination and will not pose an unacceptable human health risk.[28] Mosaic will seek that approval after EPA's approval of this Petition.

Florida is required to: "[e]ncourage recycling and resource recovery as a source of energy and materials, including in road construction. [29] FDOT Standard Specifications Section 200 dictate how various materials may be used, based on strength and stiffness considerations, permeability, and stability, among other factors.[30]

[25] FLA. ADMIN. CODE § 62-702; FLA. STAT. § 403.7045(1).
[26] FLA. ADMIN. CODE § 62-701.200(51).
[27] *Id.*
[28] FLA. DEP'T OF ENV'T PROT., Beneficial Uses of Wastes and Old Landfills (Oct. 29, 2019), https://floridadep.gov/waste/permitting-compliance-assistance/content/beneficial-uses-wastes-and-old-landfills.
[29] FLA. STAT. § 403.704(6).

[30] FLA. DEP'T OF TRANSP., Standard Specifications for Road & Bridge Construction 219, § 200 (Jan. 2022) https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/programmanagement/implemented/specbooks/january-2022/january2022-ebook.pdf?sfvrsn=752d1333_4.

Therefore, after EPA authorizes use of PG in a small-scale study pilot project, the Florida DOT will have a clear path under Florida law to consider whether the PG – aggregates test blends can meet FDOT performance criteria.[31]

10. Information and Certifications Required to Implement EPA Determination

The purpose of the study is to demonstrate the beneficial use of PG as an ingredient in engineered road base to support an application for beneficial use of PG in roads with the Florida Department of Environmental Protection (FDEP). As the regulator of beneficial use of waste products in Florida, any use of PG as road construction material must be approved by FDEP. [32] For FDEP approval, Mosaic must show that the proposed use will not cause ground water or surface water contamination and will not pose an unacceptable human health risk.[33] With these goals in mind, Mosaic contracted with Timothy Townsend, PhD, University of Florida to develop a demonstration project study design. The road is planned at the location of an existing road at the Mosaic New Wales facility, 3095 Hwy 640 W. Mulberry, FL 33860. As explained in the study design, Mosaic will construct a 1,200 ft. section of paved road, consisting of six 200 ft. sections. Three sections will incorporate PG into the road base in various mixes, between 30%-50% PG by mass. The other three sections will be designated as control sections.[34] PG will only be placed below an asphalt layer and no PG will be used in the paving layer itself. The road will be constructed consistent with FDOT testing protocols.[35] and include a 10-inch base layer and a 4-inch pavement layer. The study will employ U.S. EPA's Leaching Environmental Assessment Framework (LEAF) testing where appropriate and U.S. EPA's Industrial Waste Management Evaluation Model (IWEM) will be used in fate- and -transport modeling.[36] The PG will come from Mosaic's New Wales stack, approximately one half mile away. 2019 sampling data supports PG from the New Wales stack is well within the 15pCi/g – 35pCi/g range. Prior to removal, Mosaic will measure the average Radium-226 concentration in the location in the stack from which the PG will be removed, consistent with requirements of 40 CFR §61.207. In addition, Mosaic will comply with the certification requirements at § 61.208 and the records requirements at § 61.206 (c)-(d) and § 61.209.

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[31] The Florida DOT is required to encourage the use of products and materials with recycled content in its road construction programs and to continually update its bid procedures and specifications to encourage the use of such products and materials. *See* FLA. STAT. § 336.044(4).

[32] *See* FLA. ADMIN. CODE § 62-701.100.

[33] *See* FLA. DEP'T OF ENV'T PROT., Beneficial Uses of Wastes and Old Landfills (Oct. 29, 2019), https://floridadep.gov/waste/permitting-compliance-assistance/content/beneficial-uses-wastes-and-old-landfills.

[34] *See* Figure 1, Study Plan, for aerial view.

[35] *See generally* FLA. DEP'T OF TRANSP., Standard Specifications for Road & Bridge Construction (Jan. 2022), https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/programmanagement/implemented/specbooks/january-2022/january2022-ebook.pdf?sfvrsn=752d1333_4.

11. Disposition of Unused PG

There is unlikely to be any unused PG. If any PG is unused, it will be placed back on the stack.

12. Monitoring

There are several monitoring/sampling studies performed in the past, which are part of the existing administrative records, including sampling associated with the TFI Petitions. Separately, environmental testing and risk assessment, including soil, groundwater, PG leachability and fate-and-transport modeling will be conducted as required by FDEP and FDOT for the road specification and beneficial use approvals under the contract with the University of Florida, *See* Appendix 10 Monitoring Plan.

III. BENEFITS OF USE OF PG IN ROAD CONSTRUCTION

The benefits of using PG in road construction outweigh storage in stacks. With 1.7 billion tons of PG currently stacked throughout the U.S. and approximately 46 million tons of PG produced per year in the United States, existing practices are creating environmental, land use and viewshed concerns. EPA's approval of a small-scale pilot road will demonstrate that PG, when appropriately blended with other aggregate or cementitious materials, can meet the performance standards required for engineered road base.

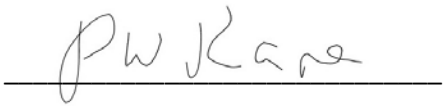
IV. Conclusion

Mosaic's request that the use of PG in a small-scale pilot road project should be deemed approved, as meeting the criteria set for at 40 C.F.R. § 61.206. Such approval constitutes final agency action under the Clean Air Act, 42 U.S.C. 7607 (b)(1), and the Administrative Procedures Act, 5 U.S.C. Section 704. Under established legal precedents, an agency approval conditioned on specified requirements "mark[s] the consummation of the agency's decision making process"[37] and determines the "rights or obligations" of relevant parties, with "direct and appreciable legal consequences."[38] The approval process outlined above satisfies these legal prerequisites.

[37] *Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457, 478 (2001) (quoting *Bennett v. Spear*, 520 U.S. 154, 178 (1997)).
[38] *Bennett,* 520 U.S. at 178 (*quoting Chi. & S. Air Lines, Inc. v. Waterman S.S. Corp.*, 333 U.S. 103, 113 (1948)).

SIGNATURE PAGE

I, Patrick Kane, am Vice President of Operations Services, North America for Mosaic Fertilizer, LLC. Mosaic Fertilizer owns and operates the New Wales phosphogypsum (PG) stack, located at 3095 Hwy 640 W. Mulberry, FL 33860, the source of the PG that will be used for construction of the proposed small-scale pilot road project. I am signing on behalf of Mosaic Fertilizer who prepared this Petition in consultation with Timothy Townsend, PhD, University of Florida.



Patrick Kane

Vice President, Operations Services,
North America, Mosaic Fertilizer, LLC.

March 31, 2022

Appendix 9

Mosaic Petition – Road Pilot Study – Radiological Risk Review

Privileged and Confidential, Attorney-Work Product

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Keith.Nadaskay@mosaicco.com

Date: 18 March 2022
Our Ref: 30108102
Subject: Phosphogypsum – Road Pilot Study – Radiological Risk Review

Dear Mr. Nadaskay,

As background information related to a petition for the use of phosphogypsum (PG) in the construction of a pilot test road (Pilot Road) on Mosaic's New Wales facility near Mulberry Florida, Arcadis is providing this letter to document a review of predicted radiological risks, related to this proposed use.

In preparing this overview of potential radiological risks associated with the development of the proposed Pilot Road, Arcadis has considered previously completed risk assessments related to PG use in roads and how these previous risk assessments relate to the proposed project.

SUMMARY STATEMENT

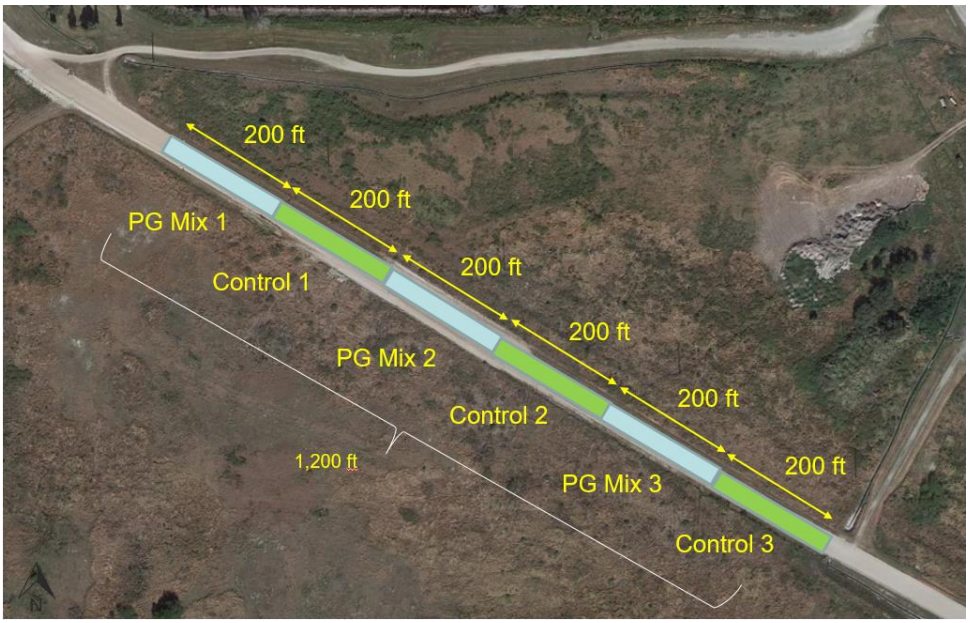
In summary, the anticipated doses and risks potentially arising from the Pilot Road project are predicted to be much smaller than those estimated from the previous PG risk assessments.

In the following sections, each of the potentially relevant exposure pathways is reviewed and considered in context of the previously completed calculations. Comments on each pathway are provided for closer review, as they relate to the petition for the Pilot Road.

PROPOSED ROAD DESIGN

Mosaic Fertilizer, LLC plans to construct a 1,200-ft section of paved road at their New Wales Facility in Mulberry, Florida. This construction project will demonstrate further the beneficial use of PG as an ingredient in engineered road bases. Laboratory research conducted at the University of Florida over the past two years supports that PG, when appropriately blended with other aggregate or cementitious materials, can meet the performance standards required for engineered road base. Figure 1 illustrates the planned location of the pilot project road.

Figure 1. Aerial View of the Proposed Pilot Project Road (1200 ft) with PG-aggregate Road Bases and Respective Control Segments (200 ft each)



The road will be constructed at the location of an existing road at the New Wales Facility. The road will be constructed outside of the current PG stacking operations in an area of reclaimed mine land. The existing road materials will be removed during construction.

A contractor will construct a 1,200-ft section of road consisting of six 200-ft sections. In three of these 200-ft sections, PG will be incorporated into the road base[1]. No PG will be used as part of the other three sections (the control sections); however, the radioactivity (in particular, the Ra-226 content) of the local aggregates used in the Pilot Road will be measured. Road base containing PG will only be placed below an asphalt pavement layer and no PG will be used in the paving layer itself.

Roadway design is currently underway, but conceptually the road will be constructed following standard Florida Department of Transportation (FDOT) practices and include a 10-inch base layer and a 4-inch pavement layer.

Three types of road base mix designs will be tested. In Mix design 1, PG will be blended with limerock (LR) sourced from an FDOT approved aggregate supplier (for B01 aggregate). In Mix design 2, PG will be blended with recycled concrete aggregate (RCA) sourced from a FDOT approved aggregate supplier (for B12 aggregate). The sources of the LR and RCA aggregates will be aggregate suppliers in the Tampa, FL area. Samples of these materials have been obtained and are currently being tested[2] as part of 3rd test mix design development. Mix design 3 will include PG (no more than 50%), sand, and Type I portland cement.

[1] The blending is assumed to be at the site of the Pilot Road but could potentially, be preblended.
[2] Including Ra-226 content.

The source of the PG will be a gypstack at the Mosaic New Wales facility (which was sampled as part of the TFI Petition.) The 2019 test data showed an average Radium 226 content of about 15 pCi/g. The PG to be used in the construction of the road will be sampled for Radium-226 content. PG is anticipated to be incorporated into the mix designs in the range of 30% to 50% by mass.

Preconstruction Testing

Mosaic is currently working with the University of Florida to design the roadway, develop construction drawings, and monitor the performance of the Pilot Road. The mix designs are being developed based on previous testing, using the materials identified for this project, and following standard FDOT testing protocols. Prior to finalizing the design, test results will be discussed with FDOT, and the mix designs will be revised as necessary. Environmental testing and risk assessment includes measurements of total concentrations of PG constituents, leachable concentrations of PG constituents, fate-and-transport modeling, and an assessment of potential radiation doses to those potentially affected.

Once appropriate EPA and Florida Department of Environmental Protection (FDEP) approvals and permits have been obtained, Mosaic will hire a contractor to construct the Pilot Road. PG will be provided to the contractor in a staging area near the construction site.

The PG and sand will be mixed by rotary tiller prior to adding cement; if possible, the entire 10-in thickness of the base will be processed at once. Otherwise, the base will be laid in two 5-in courses, scarifying the bottom layer before placing the second. After mixing cement into the base, water will be added and mixed with a rotary mixer and the base will be thoroughly compacted within 30 minutes. After the base is shaped and finished, an emulsified asphalt curing solution will be applied at 0.25 gallons per square yard. The sand-cement and PG-sand-cement bases will be left to cure for a minimum of three days before paving.

All sections will be covered by a 4-in layer of hot mix asphalt pavement as specified in Section 330 of the FDOT Standard Specifications for Road and Bridge Construction. Any remaining excavated PG not used as part of the construction project will be returned by Mosaic to the gypstack.

As part of pilot project construction, groundwater monitoring wells will be installed. The monitoring well network is still under design, but the conceptual plan is to locate groundwater well(s) upgradient and downgradient of the Pillot Road at suitable locations.

Baseline conditions will be established for the area of the Pilot Road.

The Pilot Road will be monitored before and during construction, and for at least six months. Prior to construction, background water quality samples obtained from the groundwater monitoring wells will be analyzed for a suite of constituents, including radionuclides. Additionally, soil samples will be collected from the area adjacent to the road (top 12 inches of soil). The soil samples will be analyzed for parameters typically associated with PG and stack operations including radionuclides.

During construction, contractors will be equipped with personal gamma dosimeters (likely Optically Stimulated Luminescence (OSL)). In addition, passive radon detectors will be placed around the location of proposed Pilot Road, as well as three background stations away from the Mosaic site. During mixing of PG, air monitoring including measurement of key radionuclides, will be performed proximate to the site of mixing.

The details of the proposed Pilot Road are as follows:

- Road width is 24 feet
- 10-inch road base thickness
- Density
  - PG-LR Base 126 lb/ft^3
  - PG-RCA Base 121.1 lb/ft^3
  - PG-Sand-Cement base: 115.3 lb/ft^3 (to be confirmed)
- Total Amount of PG Used: 337 tons
- Asphalt pavement – 4-inch thickness and does not contain PG.

Table 1 illustrates factors that would be considered in the fate and transport modelling and the radiation risk assessment.

Table 1. Comparison of Risk Assessment Assumptions and Pilot Study Conditions

	Assumptions in 2019 Radiological Risk Assessment	Conditions in the Pilot Study
PG in roadbed material, by weight	< 50 %	< 50 %
Ra-226 in PG	27 pCi/g [3]	<27 pCi/g
Road base	10 inches	10 inches
PG of the surface asphalt	< 2.25%	none
Thickness of surface asphalt	4-5 inches	4-5 inches
Road length	>> 1mile (5280 feet)	3 x 200 feet
Road width	48 feet (4 lanes)	24 feet (2 lanes)
Residence	> 50 feet from the road	>> 50 feet from the road

REVIEW OF RADIOLOGICAL EXPOSURE CALCULATIONS

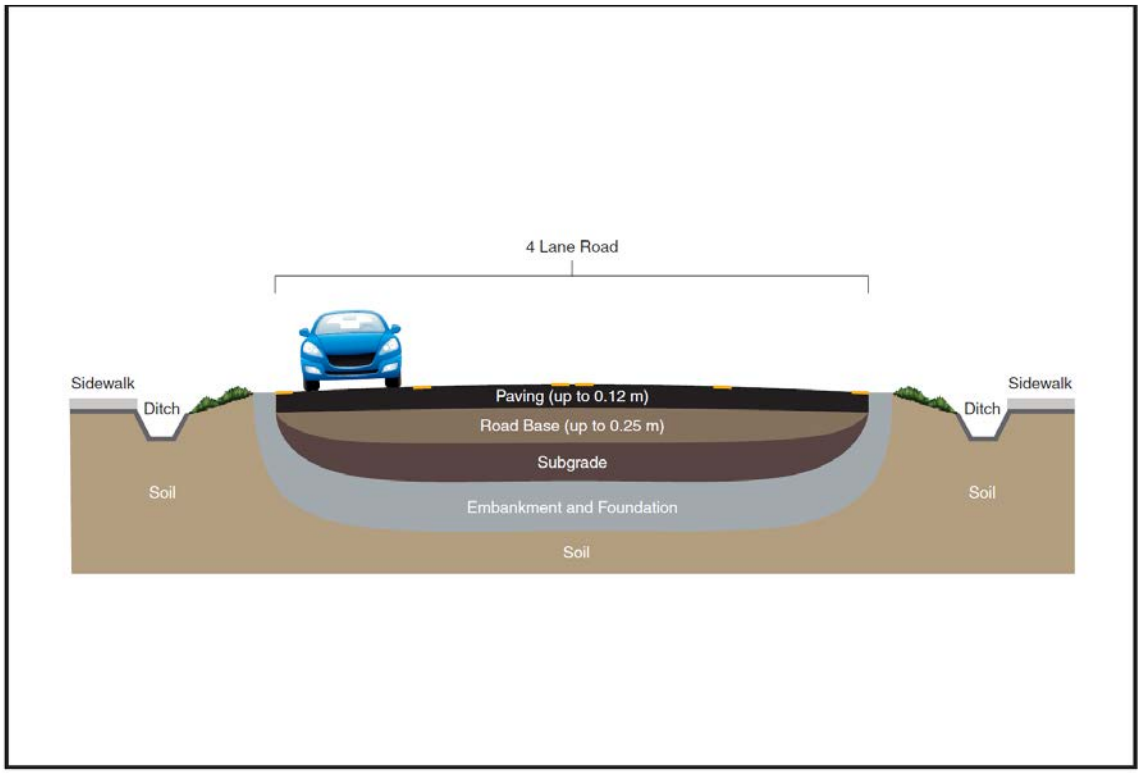
The 2019 Risk Assessment

The 2019 risk assessment performed in support of a TFI Petition for Re-use of PG as road construction considered use of PG as road base when mixed (at or less than 50%) with other materials such as soil, sand or aggregate. As shown in Figure 2, road base is a supporting layer of material ~0.25 m in thickness beneath the pavement and above underlying soil and fill. It serves to provide resiliency to the road. The 2019 risk assessment considered that PG may also be used in a smaller fraction (~2.25%) as part of the surface pavement. The design of new roads as depicted in Figure 2 affects potential for exposures by creating a degree of isolation of the base layer from the

[3] The 2019 risk assessment was based on a nominal radium-226 value of 27 pCi/g, a value based on previous work by the EPA and published information on radium-226 levels in PG. The 2019 risk assessment further considered the potential doses and risks to the RME for other concentrations of Radium-226 in PG. Although we are not aware of any PG with average Ra-226 concentrations anywhere near 148 pCi/g, such PG could in principle be used for road construction and still achieve the EPAs safe level of a risk of 3 in 10,000.

environment. This limits direct contact by the community and also limits contact of PG with surface and groundwater isolated within the base layer. The constructed road also eliminates exposure to road users from alpha and beta radiation and affords a degree of radiation shielding from gamma radiation for people using the road for driving or for nearby residents. The asphalt layer in the proposed Pilot Road, offers a similar protection.

Figure 2. Illustrated Cross-section of the Road Assessed in the 2019 Risk Assessment



In the 2019 risk assessment, five relevant and appropriate exposure scenarios were defined based on knowledge of how exposures might occur to workers and the public from using PG in road construction. The five exposure scenarios were defined, including receptors who would reasonably be expected to receive a dose either during or after construction (Table 2). These receptors include the truck driver hauling PG to the road construction site or the concrete production facility, the construction worker building the road, the resident living near the road both during and after construction and the road user, including a driver and bicyclist. In addition, a worker who spends time working on a buried utility in a trench cutting through the road and road base was assessed.

As discussed in the 2019 risk assessment, a variety of potential exposure pathways were reviewed and those potentially resulting in a non-negligible dose were selected[4]. These included direct radiological exposure from the volumes of material with PG, and ingestion and inhalation of fugitive dust. Table 2 presents the receptors, exposure

[4] Various authors have reviewed the potential doses arising from the use of PG in road construction, among them, the EPA in their BID (EPA 1992). Exposure pathways other than those discussed in this report were shown by EPA to have doses and risks an order of magnitude or more below those discussed in this report.

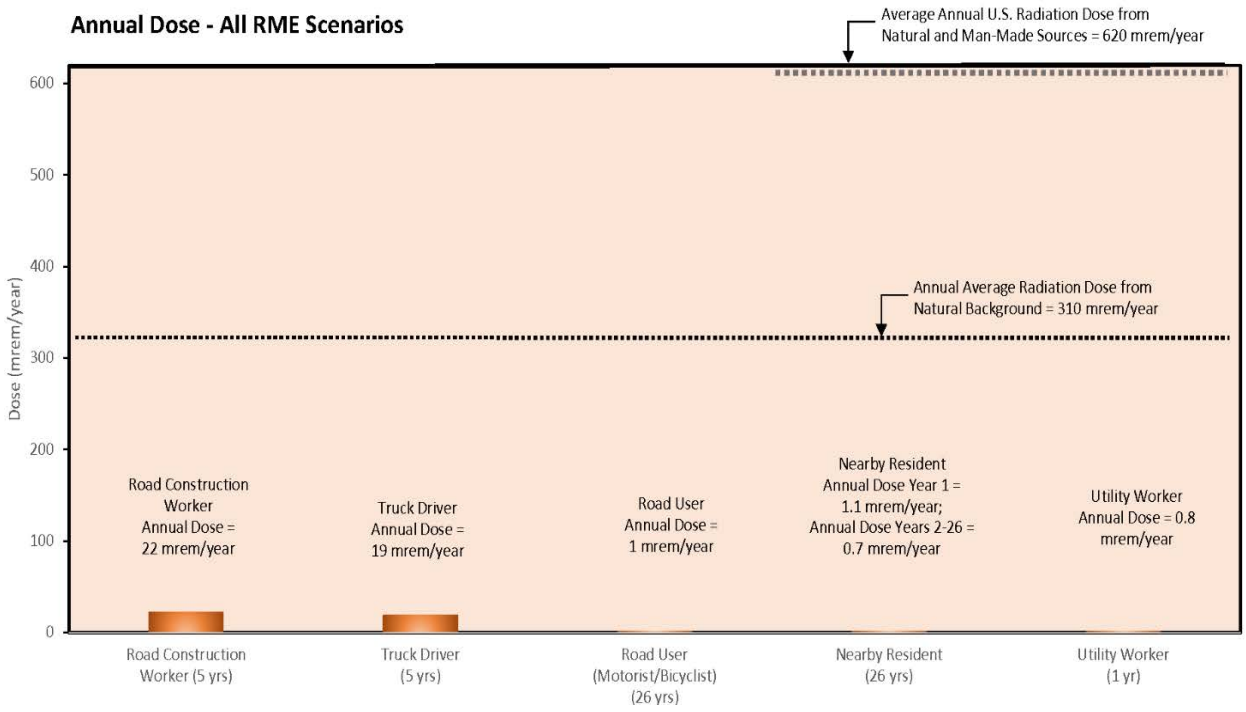
scenarios, and type of exposure. Figure 2 shows graphical depictions of these exposure scenarios. No other pathway was determined as viable or might result in a non-negligible dose.

Table 2. Exposures, Receptors and Complete Exposure Pathways

Exposure Scenario	Exposure	Exposure Pathway
Truck driver-PG to construction site)	Gamma radiation	Direct external exposure
Road Construction Worker	Gamma radiation & PG dust	Direct external exposure Inhalation /Incidental ingestion of dust
Utility worker	Gamma radiation & PG dust	Direct external exposure Inhalation /Incidental ingestion of dust
Road User (bicycle or auto)	Gamma radiation	Direct external exposure
Nearest Resident	Gamma radiation & PG dust	Direct external exposure Inhalation /Incidental ingestion of dust

Figure 3 shows the estimated annual doses for each of the receptors considered in the 2019 risk assessment.

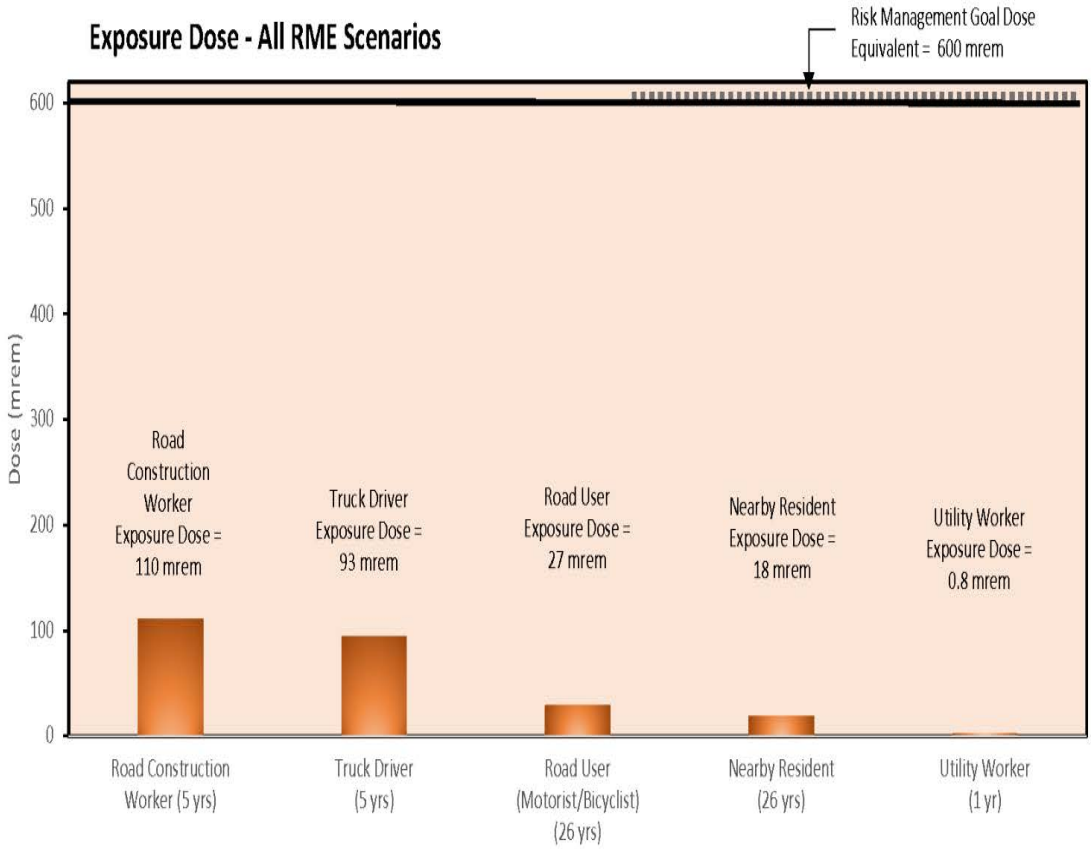
Figure 3. Estimated Annual Doses and Annual Background



As illustrated in Figure 3, all of the doses are small and a small fraction of the dose from unavoidable natural background.

Figure 4 shows the total exposures and risks from the 2019 risk assessment.

Figure 4. Estimated Total Doses and Risk



The information in Figure 4 demonstrates that the cumulative (over time) doses and risks from use of PG as road base are small, well below EPAs risk level and small compared to the unavoidable dose from natural background.

It should be noted that the 2019 risk assessment was based on a nominal radium-226 value of 27 pCi/g, a value based on previous work by the EPA and published information on radium-226 levels in PG. The 2019 risk assessment further examined the potential dose to the most exposed receptor (RME), the road construction worker who was estimated to receive a risk of about 0.55 per 10,000 from the Radium-226 in the PG used in road construction. With all other factors the same, the potential doses and risks to the RME arising from the use of PG in road construction can be scaled on the basis of relative concentrations of radium-226 in PG. For example, discussed in the 2019 risk assessment, the risks to a road construction worker arising from the use of PG containing, for example, 35 pCi/g[5] of radium-226 would be about 0.7 in 10,000 (i.e., 0.5/10,000 x 35/27).

Potential Doses and Risks from the proposed Pilot Road

Table 3 considers the applicability of the 2019 risk assessment exposure scenarios for the proposed Pilot Road at Mosaic. The table also provides a preliminary comment on the magnitude of the expected exposure relative to the previous estimates.

[5] Although we are not aware of any PG with average Ra-226 concentrations anywhere near 148 pCi/g, such PG could in principle be used for road construction and still achieve the EPAs safe level of a risk of 3 in 10,000.

Table 3. The 2019 Risk Assessment for the Pilot Road Construction Exposures

Receptors Considered	Exposure Pathways	Applicable to Pilot Road	Basis for Decision	RME Radiation Doses
Truck Driver who delivers PG for road base material to construction site	Gamma radiation	**Yes**	PG will need to be delivered to the test road construction site	Given the size of the proposed test road, the amount of PG that will be required is very much smaller than that required for the 4-lane county road considered in the 2019 risk assessment. The truck drivers would be exposed for a period of a few weeks to a month, rather than the 5 years assumed in the 2019 risk assessment, and thus, on this basis alone, the dose (and risk) to the truck driver transporting PG for the test road would be about 1/60th of that of the dose or about 1.6 mrem for a truck driver worker who works on the Pilot road. The unavoidable dose from natural background is about 311 mrem and the incremental dose to the RME is negligible compared to dose or risk criteria and a tiny fraction of the natural background dose.
Road Construction Worker who works on roads built exclusively with PG material	Gamma radiation and PG in dust	**Yes**	Workers who build the test road have potential for exposure to PG	Given the size of the proposed test road, the time to construct the test road is very much smaller – of the order of a few weeks to a month, rather than the 5 years assumed for construction of the 4-lane county road considered in the 2019 risk assessment. Thus, on this basis alone, the dose (and risk) to the construction worker who works on the test road would be about 1.8 mrem (i.e., about 1/60th of that estimated for the construction worker from the 2019 risk assessment) The unavoidable dose from natural background is about 311 mrem and hence, he incremental dose to the RME is negligible compared to dose or risk criteria and a tiny fraction of the natural background dose.
Utility worker	Gamma radiation and PG in dust	**No**	The site is controlled by Mosaic and there is no public access or uncontrolled construction	Not Applicable

Receptors Considered	Exposure Pathways	Applicable to Pilot Road	Basis for Decision	RME Radiation Doses
Road User (motorist/bicyclist) on PG-constructed roads	Gamma radiation	**No**	The site is controlled by Mosaic and there is no public access	Given the test road is on the Mosaic site, no public use or exposures are expected. Consideration of other road users such as Mosaic workers travelling on the road is possible but would result dose and exposures much less than those estimated in the 2019 risk assessment considering the PG containing portion of the road would be narrower and shorter than the road assessed in the 2019 risk assessment. The road user dose and exposures in the 2019 risk assessment was already very small, so the dose to the test road user would be negligible compared to dose or risk criteria and a tiny fraction of the natural variation in natural background dose.
Resident Living Near Road	Gamma radiation and PG in dust	**No**	The radiation levels from the road studied in the 2019 risk assessment decrease rapidly with increasing distance. As the site is controlled by Mosaic and there is no possibility of a residence being constructed nearby the site of the test road	Not Applicable
At EPA's request, the 2019 risk assessment considered a **reclaimer** scenario, which as discussed in the Petition and the 2019 risk assessment, is not considered as a reasonable maximum exposure (RME) scenario	Gamma exposure and radon	**No**	Given the size of the proposed test road and the observation that the test road will be constructed on Mosaic property, a reclaimer scenario is not reasonably plausible.	Not Applicable

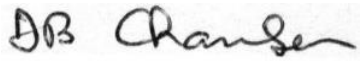
CONCLUSIONS

This review discussed that the Pilot Road is proposed to be at a size and scale that is a fraction of the road examined in detail in the 2019 TFI petition for PG use in roads. Consequently, it was shown that any potential exposures dose and risk related to the use of PG in the Pilot Road will be substantially smaller than the exposures dose and risk estimated for the 2019 TFI petition. In addition, some of the exposure (receptor) scenarios have been shown to not be applicable to this proposed use, effectively eliminating that potential risk.

The 2019 TFI petition showed that the total risk would be well below accepted risk criteria. Through this review and comparison, it can clearly be seen that the total risk associated with the use of PG in the Pilot Road can reasonably be expected to be well below the risk calculated for the 2019 TFI petition and by extension an even smaller fraction of the acceptable risk criterion.

Sincerely,

Arcadis Canada Inc.



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Appendix 10

Mosaic Petition – The Monitoring Plan for the Small-Scale Pilot Road Study

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Date: 31 March 2022
Our Ref: 30108102
Subject: Phosphogypsum – Road Pilot Study – Proposed Monitoring Plan

Dear Mr. Nadaskay,

As background information related to a petition for the use of phosphogypsum (PG) in the construction of a pilot test road (Pilot Road) on Mosaic's New Wales facility near Mulberry Florida, this document provides a review of proposed environmental monitoring, related to this proposed use.

INTRODUCTION

Mosaic Fertilizer, LLC plans to construct a 1,200-ft section of paved road at their New Wales Facility in Mulberry, Florida. This construction project will demonstrate further the beneficial use of PG as an ingredient in engineered road bases. Laboratory research conducted at the University of Florida over the past two years supports that PG, when appropriately blended with other aggregate or cementitious materials, can meet the performance standards required for engineered road base.

Furthermore, environmental testing of PG aggregate blends supports that a properly designed and constructed road will meet conventional human health risk criteria sufficient for beneficial use. The pilot project described here serves as a next step in developing safe and economic recycling options for PG in Florida.

PILOT PROJECT DESCRIPTION

Figure 1 illustrates the planned location of the pilot project road. The road will be constructed at the location of an existing road at the New Wales Facility. The road will be constructed outside of the current PG stacking operations in an area of reclaimed mine land. The existing road materials will be removed during construction.

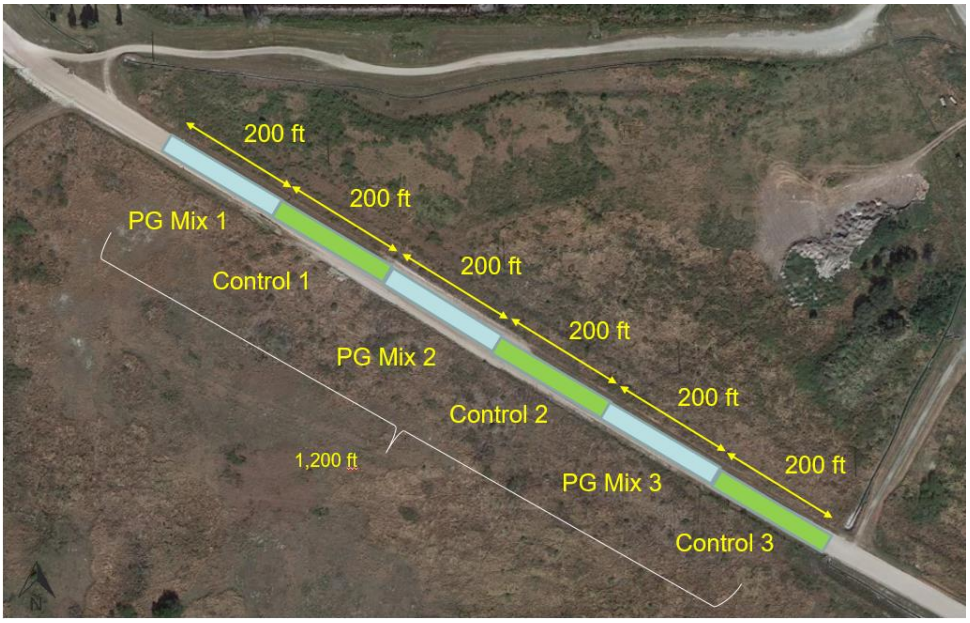
A contractor will construct a 1,200-ft section of road consisting of six 200-ft sections. In three of these 200-ft sections, PG will be incorporated into the road base[1]. No PG will be used as part of the other three sections (the control sections); however, the radioactivity (in particular, the Radium 226 content) of the local aggregates used in

[1] The blending is assumed to be at the site of the Pilot Road but could potentially, be preblended.

the Pilot Road will be measured. Road base containing PG will only be placed below an asphalt pavement layer and no PG will be used in the paving layer itself.

Roadway design is currently underway, but conceptually the road will be constructed following standard Florida Department of Transportation (FDOT) practices and include a 10-inch base layer and a 4-inch pavement layer.

Figure 1. Aerial View of the Proposed Pilot Project Road (1200 ft) with PG-aggregate Road Bases and Respective Control Segments (200 ft each)



Three types of road base mix designs will be tested. In Mix design 1, PG will be blended with limerock (LR) sourced from an FDOT approved aggregate supplier (for B01 aggregate). In Mix design 2, PG will be blended with recycled concrete aggregate (RCA) sourced from a FDOT approved aggregate supplier (for B12 aggregate). The sources of the LR and RCA aggregates will be aggregate suppliers in the Tampa, FL area. Samples of these materials have been obtained and are currently being tested[2] as part of 3rd test mix design development. Mix design 3 will include PG (no more than 50%), sand, and Type I portland cement.

The source of the PG will be a gypstack at the Mosaic New Wales facility, which is approximately one-half mile from the pilot road site. (This stack was previously sampled as part of the TFI Petition.) The 2019 test data showed an average Radium 226 content of about 15 pCi/g, however the requested 35 pCi/g is adequate to cover any unexpected variations. An additional round of sampling for Radium 226 content will take place prior to the initiation of construction. PG is anticipated to be incorporated into the mix designs in the range of 30% to 50% by mass.

[2] Including Radium-226 content.

PRECONSTRUCTION TESTING

Mosaic is currently working with the University of Florida to design the roadway, develop construction drawings, and monitor the performance of the Pilot Road. The mix designs are being developed based on previous testing, using the materials identified for this project, and following standard FDOT testing protocols. Prior to finalizing the design, test results will be discussed with FDOT, and the mix designs will be revised as necessary. Environmental testing and risk assessment includes measurements of total concentrations of PG constituents, leachable concentrations of PG constituents, fate-and-transport modeling, and an assessment of potential radiation doses to those potentially affected. See Mosaic 2022 Petition, Appendix 9.

As part of the pilot study, U.S. EPA's Leaching Environmental Assessment Framework (LEAF) testing will be employed where appropriate and U.S. EPA's Industrial Waste Management Evaluation Model (IWEM) will be used in fate and transport modeling.

Table 1 illustrates factors that would be considered in the fate and transport modeling and the radiation risk assessment.

Table 1. Comparison of Risk Assessment Assumptions and Pilot Study Conditions

	Assumptions in 2019 Radiological Risk Assessment	Conditions in the Pilot Study
PG in roadbed material, by weight	< 50 %	< 50 %
Ra-226 in PG	35 pCi/g [3]	<35 pCi/g
Road base	10 inches	10 inches
PG of the surface asphalt	< 2.25%	none
Thickness of surface asphalt	4-5 inches	4-5 inches
Road length	>> 1mile (5280 feet)	3 x 200 feet
Road width	48 feet (4 lanes)	24 feet (2 lanes)
Residence	> 50 feet from the road	>> 50 feet from the road

PILOT CONSTRUCTION

Once appropriate EPA and Florida Department of Environmental Protection (FDEP) approvals and permits have been obtained, Mosaic will hire a contractor to construct the Pilot Road. PG will be provided to the contractor in a staging area near the construction site.

[3] The initial calculations in the 2019 risk assessment were based on a nominal radium-226 concentration in PG of 27 pCi/g, a value based on previous work by the EPA and published information on radium-226 levels in PG. The 2019 risk assessment further considered the potential doses and risks to the RME for various other concentrations of radium-226 in PG. Although we are not aware of any PG with average Ra-226 concentrations anywhere near 148 pCi/g, such PG could in principle be used for road construction and still achieve the EPA's safe level of a risk of 3 in 10,000. The 2019 petition was submitted for approval using a reasonable upper bound concentration of radium-226 in PG of 35 pCi/g.

The PG and sand will be mixed by rotary tiller prior to adding cement; if possible, the entire 10-in thickness of the base will be processed at once. Otherwise, the base will be laid in two 5-in courses, scarifying the bottom layer before placing the second. After mixing cement into the base, water will be added and mixed with a rotary mixer and the base will be thoroughly compacted within 30 minutes. After the base is shaped and finished, an emulsified asphalt curing solution will be applied at 0.25 gallons per square yard. The sand-cement and PG-sand-cement bases will be left to cure for a minimum of three days before paving.

All sections will be covered by a 4-in layer of hot mix asphalt pavement as specified in Section 330 of the FDOT Standard Specifications for Road and Bridge Construction. Any remaining excavated PG not used as part of the construction project will be returned by Mosaic to the gypstack.

MONITORING

As part of pilot project construction, groundwater monitoring wells will be installed. The monitoring well network is still under design, but the conceptual plan is to locate groundwater well(s) upgradient and downgradient of the Pilot Road at suitable locations.

Baseline conditions will be established for the area of the Pilot Road.

The Pilot Road will be monitored before and during construction, and for at least six months after construction. Prior to construction, background water quality samples obtained from the groundwater monitoring wells will be analyzed for a suite of constituents, including radionuclides. Additionally, soil samples will be collected from the area adjacent to the road (top 12 inches of soil). The soil samples will be analyzed for parameters typically associated with PG and stack operations including radionuclides.

During construction, contractors will be equipped with personal gamma dosimeters (likely Optically Stimulated Luminescence (OSL)). In addition, passive radon detectors will be placed around the location of proposed Pilot Road, as well as three background stations away from the Mosaic site. During mixing of PG, air monitoring including measurement of key radionuclides, will be performed proximate to the site of mixing.

After construction is completed, the geotechnical performance of the roadway will be monitored following recommendations provided by the FDOT. In addition, a gamma scan of the road surface will be performed on each of the road sections. In this respect, it is anticipated that these data will also provide proof of concept for future radiation risk assessments for roads constructed with PG.

Table 2 summarizes the monitoring to be conducted prior, during and after construction of the Pilot Road.

Table 2. Proposed Environmental Monitoring for Pilot Road Construction and Operation

Type of Monitoring	Description / Parameters	Timing / Duration
Personal gamma dosimeters - Construction Workers - Truck Drivers	Likely Optically Stimulated Luminescence (OSL)	Throughout construction period
External gamma radiation measurements	On and beside the Pilot Road	Baseline – prior to construction; During construction – prior to application of asphalt layer; After construction – operational period
Groundwater Monitoring	Located up and down gradient with respect to groundwater flow; Evidence of leachate from PG; Radioactivity concentrations; Other constituents of potential concern	Baseline – prior to construction; After construction – operational period for at least six months.

CLOSING

If you have any questions regarding this document or the proposed monitoring plan, please feel free to contact me.

Sincerely,

Arcadis Canada Inc.

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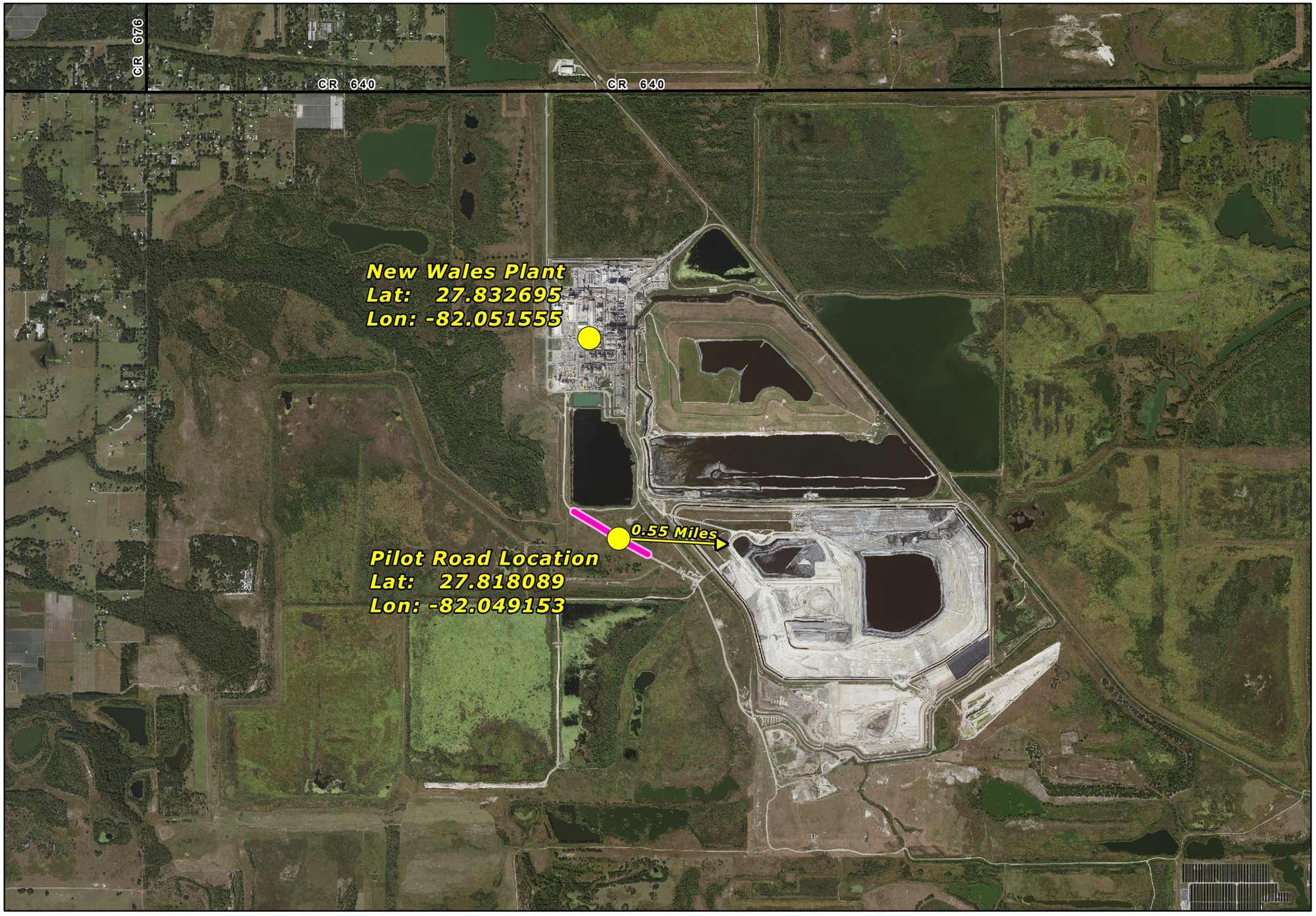
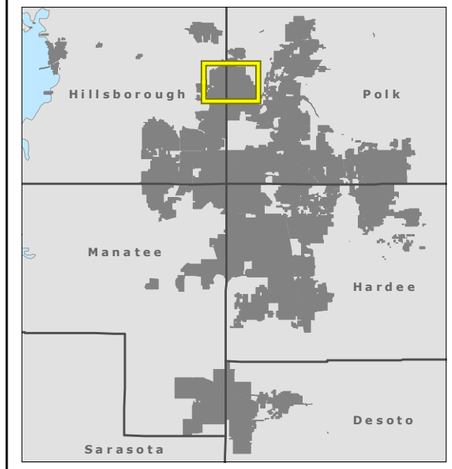
Appendix 11

Site Map – Location of the Road

New Wales Pilot Road



Location Key



Legend

- Points of Interest
- Pilot Road Project
- Distance to Stack
- Major Roads

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Appendix 12

New Wales Stack Data

New Wales Radium Ra-226 - September 2019 in pCi/g	
Sample 1	16.6
Sample 2	17.3
Sample 3	17.5
Sample 4	19.3
Sample 5	10.3
Sample 6	18.6
Sample 7	10.4
Sample 8	11.0
Sample 9	13.8
Sample 10	15.3
Average	15.01
Median	15.95

News Wales Gamma Results – September 2019 in microR/hr	
Avg Gamma @ Surface	51
Avg Gamma 1m Above Surface	44

Tab 4

E-DOCKET: EPA-HQ-OAR-2024-0446

REVIEW OF THE SMALL-SCALE ROAD PILOT PROJECT ON PRIVATE LAND IN FLORIDA SUBMITTED BY MOSAIC FERTILIZER, LLC

October 1, 2024

U. S. ENVIRONMENTAL PROTECTION AGENCY

Office of Radiation and Indoor Air

Radiation Protection Division

1200 Pennsylvania Ave., NW

Washington, DC 20460

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Acronyms and Abbreviations:

CPG	Critical Population Group
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
EPA	Environmental Protection Agency
LR	Limerock
NESHAPs	National Emissions Standard for Hazardous Air Pollutants
ORIA	Office of Radiation and Indoor Air
PG	Phosphogypsum
Ra-226	Radium-226
RAP	Reclaimed asphalt pavement
RCA	Recycled concrete aggregate
RCRA	Resource Conservation and Recovery Act
TFI	The Fertilizer Institute

I. Executive Summary:

This document details the review performed by the U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Radiation Protection Division (EPA or the Agency), in response to the request for approval of the *Small-scale Road Pilot Project on Private Land in Florida* submitted by Mosaic Fertilizer, LLC in March 2022 (Mosaic 2022a), and updated by the *Revised Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project*, submitted in August 2023 (Mosaic 2023).

The purpose of this review was to evaluate, via the processes identified in 40 CFR 61.206 and EPA guidance, whether the request and risk analysis submitted by Mosaic were sufficient to demonstrate that the project as proposed fell below risk thresholds previously defined by EPA for approval of other uses of phosphogypsum (also referred to as PG). Review of the Mosaic request was performed by a technical team led by the Radiation Protection Division in consultation with other EPA program offices.

The Agency's review found that Mosaic's request is complete per the requirements of 40 CFR 61.206(b). The review additionally found that Mosaic's risk assessment is technically acceptable, and that the potential radiological risks from the proposed project meet the regulatory requirements of 40 CFR 61.206(c); that is, the project poses no greater radiological risk than maintaining the phosphogypsum in a stack. Therefore, the small-scale pilot project may be approved by the Agency per 40 CFR 61.206. Approval by the Agency would be specific to the pilot project as described in the Mosaic request, and indicates only that this project meets the approval requirements of the Subpart R NESHAP. Mosaic must still comply with all other federal, state, or local laws, regulations, or restrictions on the use of phosphogypsum. Mosaic has informed EPA that it is seeking approval under the Subpart R NESHAP before seeking other regulatory approvals (Mosaic 2022b).

The risk analysis submitted by Mosaic is based upon the generic risk assessment scenarios previously submitted by The Fertilizer Institute (TFI) in 2019 to support road construction projects that could vary in location and design. EPA's review evaluated the current submission in the context of previous risk assessments and other technical work that has been performed on the topic of road use. The technical review concludes that the risk assessment submitted with this request is appropriate to evaluate the pilot project road built using phosphogypsum in the manner described in Mosaic's request. In cases where actual parameters of the proposed pilot project vary from the parameters used in the risk assessment calculations (e.g., the dimensions of the road and concentration of radium-226 [Ra-226] in phosphogypsum), the generic risk assessments overestimate the potential risks associated with the pilot project. Specifically, the generic risk assessments are based on roads that are longer, wider, and contain phosphogypsum with a higher concentration of radium-226, and therefore overestimate the potential dose from the proposed pilot project.

§61.206 requires that to be approved, a proposed use must be at least as protective as maintaining the phosphogypsum in a stack. EPA further defined this benchmark as causing an additional lifetime risk of fatal cancer no greater than 3×10^{-4} (3 in 10,000, or .03%) (57 FR 23311-23312, June 3, 1992). Mosaic's risk analysis states that numerical estimates of the total lifetime risks of fatal cancer to workers moving phosphogypsum and constructing the project are less than 2×10^{-6} (2 in 1,000,000, or .0002%). Estimated risks to users of the road (facility employees not associated with construction of

the pilot project) are significantly less than 1×10^{-6} (1 in 1,000,000, or .0001%). Estimates of risk to the nearest members of the public are likewise significantly less than 1×10^{-6}. EPA's review supports Mosaic's statement that "…the radiological risk for the 2022 Mosaic Pilot Study is likely less than 1 in 1 million," (Mosaic 2022a, p. 6), and based on EPA's evaluation of the risk assessment, the proposed project study meets the Agency's threshold value and risks to workers and the public will not exceed 3×10^{-4} (3 in 10,000, or .03%). From a technical standpoint, therefore, the risk of this use can be considered to be no greater than the risk of maintaining the phosphogypsum in a stack.

The risks analyzed in this document are the risks associated with this specific project, and this review does not imply approval of any other request. Any use other than the pilot project addressed by this report would require a specific separate application, risk assessment, and review. EPA's full review process, including risk assessment, must take place for each request for other use of phosphogypsum, and approvals are granted on a case-by-case basis.

II. Content of Mosaic's Request Submitted to EPA:

Mosaic requested meetings with EPA in December 2021, and in March 2022 to discuss submission of a request for approval of a pilot project using phosphogypsum in road base. Mosaic submitted a draft request under §61.206 on March 18, 2022 and a final request on March 31, 2022. In this request, Mosaic identified that they would like to construct, in collaboration with researchers at the University of Florida, a small-scale pilot project using phosphogypsum in road base in test road sections on Mosaic's New Wales facility. Mosaic requested to construct three 200-foot sections of road with varying mixtures of phosphogypsum in the road base in order "to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge construction." (Mosaic 2022a, p. 4) After reviewing Mosaic's initial request, EPA submitted questions on September 9, 2022, via email, and Mosaic provided additional information in response to EPA's questions on December 22, 2022. On August 23, 2023, Mosaic sent EPA a revised request for approval that changed several of the pilot road study specifications after receiving input from the Florida Department of Transportation (Florida DOT, or FDOT). The main design changes include: 1) increasing the length of the test sections from 200 feet to 500 feet, 2) increasing the length of the control sections from 200 feet to 300 feet, 3) adding one more set of test and control sections for evaluating a mixture of phosphogypsum and reclaimed asphalt pavement (RAP). These changes result in the total length of the pilot road increasing to 3200 feet and the total amount of PG to be used to approximately 1200 tons. Soil, groundwater, and lysimeter monitoring for all sections will also be expanded (Townsend et al., 2024).

The phosphogypsum used in the project will come from the New Wales South stack. Sampling performed to date indicates that phosphogypsum from the stack has an average radium-226 activity concentration of approximately .56 bequerel per gram (Bq/g), or 15.1 picocuries per gram (pCi/g) (Mosaic 2022a). The test sections of road will be 7.3 meters (24 feet) in width and the road base containing phosphogypsum will be 25.4 centimeters (10 inches) in thickness, with a density ranging from 1.8-2.0 g/cm^3 (115-126 lb/ft^3). The project road will be paved with 10 centimeters (4 inches) of asphalt, and the pavement will not contain phosphogypsum (Townsend et al., 2024). See Figure 3 for a schematic cross section of the road.

Figure 1: Overhead view of New Wales facility. Location of the pilot project road and nearest residence are highlighted. Mosaic property is shown in blue (Mosaic 2024b).

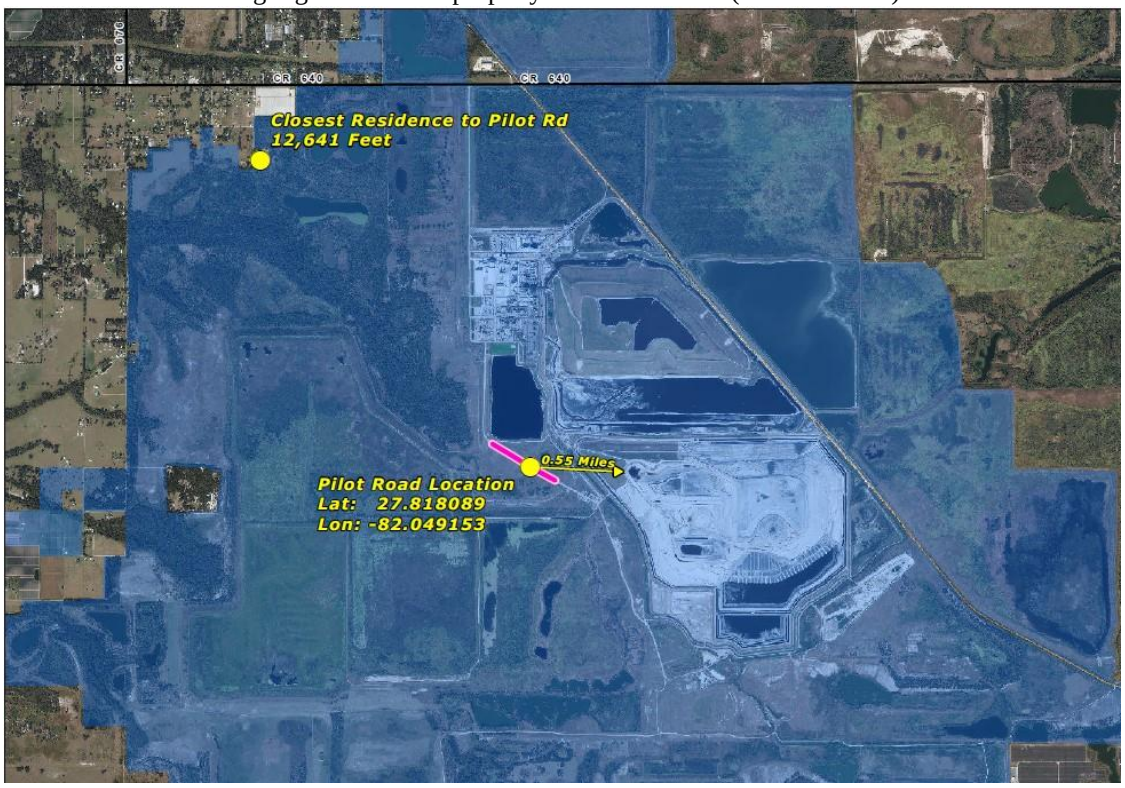
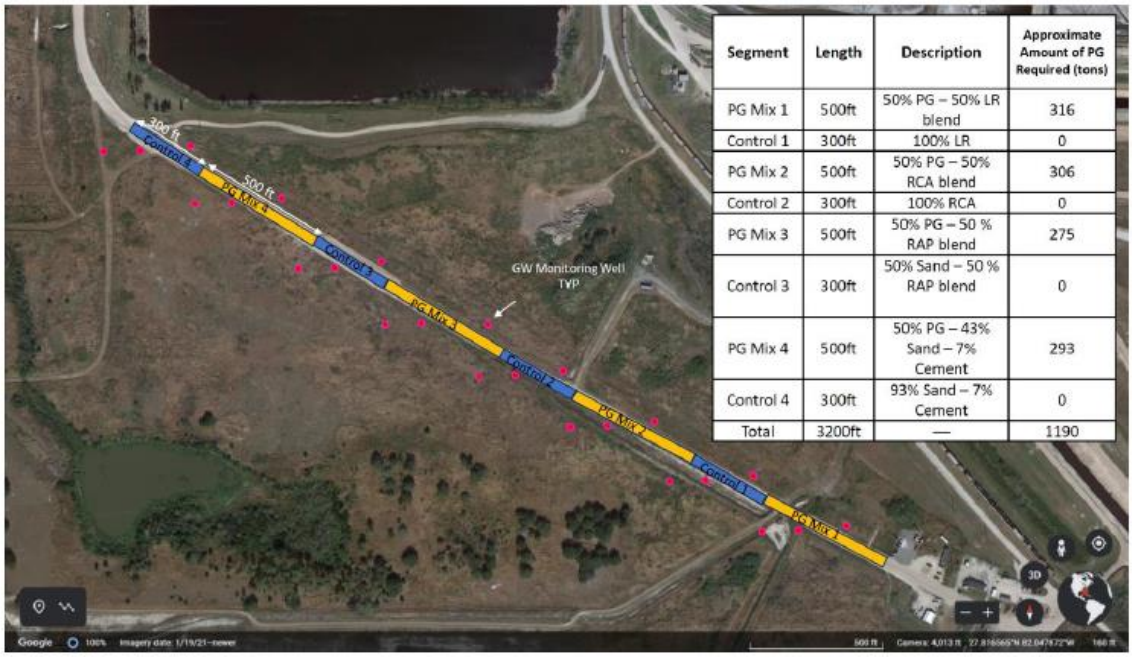
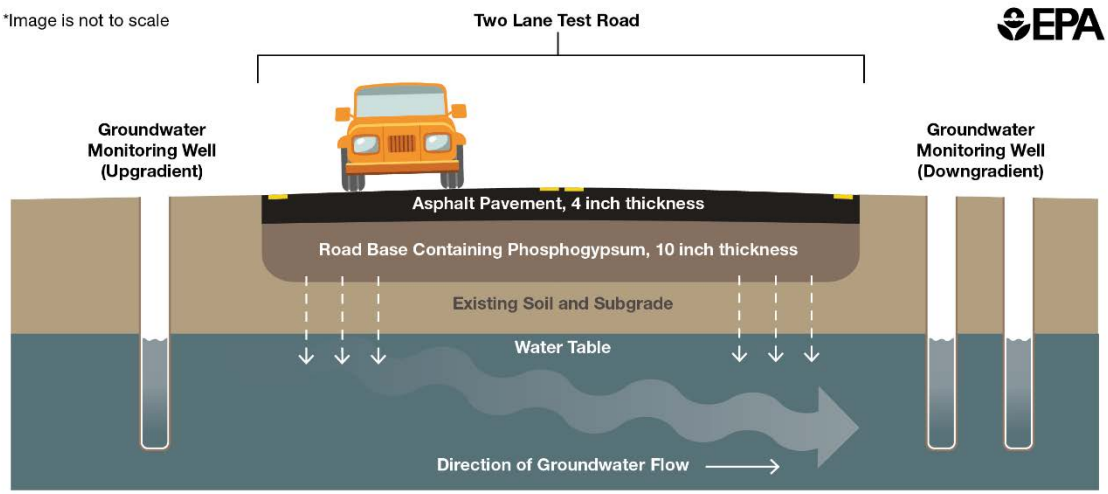


Figure 2: Overhead view of the revised, lengthened pilot project. Test sections are depicted in yellow, control sections in blue, and groundwater monitoring well locations in magenta.



Segment	Length	Description	Approximate Amount of PG Required (tons)
PG Mix 1	500ft	50% PG – 50% LR blend	316
Control 1	300ft	100% LR	0
PG Mix 2	500ft	50% PG – 50% RCA blend	306
Control 2	300ft	100% RCA	0
PG Mix 3	500ft	50% PG – 50 % RAP blend	275
Control 3	300ft	50% Sand – 50 % RAP blend	0
PG Mix 4	500ft	50% PG – 43% Sand – 7% Cement	293
Control 4	300ft	93% Sand – 7% Cement	0
Total	3200ft	—	1190

Figure 3: Cross-section of the proposed pilot project road.



Mosaic developed its risk assessment by adapting the generic risk assessments for road use prepared for the Fertilizer Institute (Arcadis 2019) to the specific scenarios associated with the proposed pilot project. The risk assessment documentation was incorporated into Mosaic's request by reference, and is discussed in detail below, in "Results of Risk Assessment." After reviewing Mosaic's initial request, EPA submitted questions on September 9, 2022, via email, and Mosaic provided additional information in response to EPA's questions on December 22, 2022. Mosaic submitted its revised application dated August 23, 2023. EPA held a virtual meeting with Mosaic in November 2023 and submitted additional questions by email on December 15, 2023. Mosaic provided responses to those questions on February 7, 2024. EPA's analyses are based on the full suite of information submitted by Mosaic.

Mosiac's submissions related to the proposed pilot project are listed below, in chronological order of reciept:

March 31, 2022: *Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R § 61.206, Small-scale Road Pilot Project on Private Land in Florida.* (Mosaic 2022a.) This document contains the formal request by Mosaic. The risk assessment and radiological monitoring plan, both by Arcadis, are included in the document as Appendices 9 and 10.

December 22, 2022: *Response to EPA September 9, 2022 Request for Information; Small-scale Pilot Project*. (Mosaic 2022b.) This document responds to EPA questions and describes leach testing results, modeling results, and site hydrogeology.

August 23, 2023: *Revised Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project*. (Mosaic 2023) Cover letter from Pat Kane to Jonathan Walsh describes changes made to the proposed project. *Phosphogypsum – Road Pilot Study – Radiological Risk Review – Update* (Arcadis 2023) is attached to this correspondence.

February 7, 2024: *Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project; November 27, 2023, Meeting; Response to Questions*. (Mosaic 2024a). Question responses and Mosaic presentation slides in body of letter. Environmental study design document, *Beneficial Use of Mosaic Phosphogypsum* (Townsend, et al. 2024) attached, together with other reference materials on phosphogypsum road use.

March 26, 2024: Updated map provided at EPA's request (Mosaic 2024b).

III. Scope of EPA's review:

40 CFR §61.206 sets the requirements for a request for other uses of phosphogypsum. The purpose of this review was to determine whether the requirements of §61.206 have been met, to inform a decision by the Assistant Administrator for Air and Radiation.

The technical review is primarily focused on radiological risk posed by the pilot project, which is the basis for the regulation of phosphogypsum under the Clean Air Act and approval of other uses of phosphogypsum under 40 CFR §61.206, the text of which is included below. EPA additionally used its completeness review to fully document the pilot project, including design of the environmental studies that address both radiological and non-radiological contaminants associated with the project. Approval under 40 CFR §61.206 does not relieve Mosaic of the responsibility to comply with other federal, state, or local laws, regulations, or restrictions on the use of phosphogypsum. The relevant section of the regulation is included below:

A. § 61.206 Distribution and use of phosphogypsum for other purposes.

(a) Phosphogypsum may not be lawfully removed from a stack and distributed or used for any purpose not expressly specified in § 61.204 or § 61.205 without prior EPA approval.

(b) A request that EPA approve distribution and/or use of phosphogypsum for any other purpose must be submitted in writing and must contain the following information:

(1) The name and address of the person(s) making the request.

(2) A description of the proposed use, including any handling and processing that the phosphogypsum will undergo.

(3) The location of each facility, including suite and/or building number, street, city, county, state, and zip code, where any use, handling, or processing of the phosphogypsum will take place.

(4) The mailing address of each facility where any use, handling, or processing of the phosphogypsum will take place, if different from paragraph (b)(3) of this section.

(5) The quantity of phosphogypsum to be used by each facility.

(6) The average concentration of radium-226 in the phosphogypsum to be used.

(7) A description of any measures which will be taken to prevent the uncontrolled release of phosphogypsum into the environment.

(8) An estimate of the maximum individual risk, risk distribution, and incidence associated with the proposed use, including the ultimate disposition of the phosphogypsum or any product in which the phosphogypsum is incorporated.

(9) A description of the intended disposition of any unused phosphogypsum.

(10) Each request shall be signed and dated by a corporate officer or public official in charge of the facility.

(c) The Assistant Administrator for Air and Radiation may decide to grant a request that EPA approve distribution and/or use of phosphogypsum if he determines that the proposed distribution and/or use is at lease as protective of public health, in both the short term and the long term, as disposal of phosphogypsum in a stack or a mine.

(d) If the Assistant Administrator for Air and Radiation decides to grant a request that EPA approve distribution and/or use of phosphogypsum for a specified purpose, each of the following requirements shall be satisfied:

(1) The owner or operator of the stack from which the phosphogypsum is removed shall determine annually the average radium-226 concentration at the location in the stack from which the phosphogypsum will be removed, as provided by § 61.207.

(2) All phosphogypsum distributed in commerce by the owner or operator of a phosphogypsum stack, or by a distributor, retailer, or reseller, or purchased by the end-user, shall be accompanied at all times by certification documents which conform to the requirements § 61.208.

(3) The end-user of the phosphogypsum shall maintain records which conform to the requirements of § 61.209(c).

(e) If the Assistant Administrator for Air and Radiation decides to grant a request that EPA approve distribution and/or use of phosphogypsum for a specified purpose, the Assistant Administrator may decide to impose additional terms or conditions governing such distribution or use. In appropriate circumstances, the Assistant Administrator may also decide to waive or modify the recordkeeping requirements established by § 61.209(c).

IV. Structure of EPA's review:

EPA published a guidance document titled "Applying to EPA for Approval of Other Uses of Phosphogypsum: Preparing and Submitting a Complete Petition Under 40 CFR 61.206" (EPA 2005), hereafter referred to as the "Workbook", to clarify expectations for submissions and reviews for other uses of phosphogypsum. EPA's review was structured according to Section 2.4 of the Workbook, *What steps will EPA take to review and approve my petition?* Per the Workbook, EPA's process is to first determine whether sufficient information has been submitted by any applicant to be considered a complete application, and then to perform a technical review of the information submitted.

This document reflects the findings of EPA ORIA's completeness and technical reviews, and has been crafted to support an EPA decision on a request for other use per §61.206. Should EPA publish a notice of pending approval, then this review document, together with all materials submitted and cited by Mosaic, will be made available for public review and comment. Adverse comments will be addressed before a final approval of the project is issued.

V. Results of EPA's Completeness Review:

The purpose of the completeness review is to determine whether EPA has received all of the information required by the regulation in sufficient detail to review a request and draw conclusions.

Section 2.4 of the Workbook identifies three elements of a completeness review:

> *Element 1: A demonstration that the potential radiological risk from the alternative use is at least as protective as placement of phosphogypsum in a stack or mine.*

Mosaic has provided a complete description of the intended pilot project, including detailed explanations of why the exposure scenarios for the proposed project are bounded by the parameters of the generic risk assessments developed for TFI. See the Mosaic 2022a, Appendix 9, *Radiological Risk Review*, and Arcadis 2023, *Phosphogypsum – Road Pilot Study – Radiological Risk Review - Update*. Sufficient information has been provided to allow EPA to perform a technical review of risks to the public from the proposed pilot project. EPA's review is documented in the section of this document titled "Results of EPA's Technical Review."

> *Element 2: A description of the proposed monitoring scheme covering both radiological and non-radiological parameters, with sufficient detail to demonstrate that the project does not adversely affect the environment, or a justification for why monitoring is not needed.*

Initial information on Mosaic's environmental sampling and monitoring plans are described in Appendix 10 of its March 2022 request, *Proposed Monitoring Plan*. The petition commits to dosimetry for contract workers building the road, radon and radioactive particulate air sampling, and gamma radiation rate measurements before and after construction (Mosaic 2022a, p. 4). Groundwater monitoring will address both radiological and non-radiological parameters (Mosaic 2022a, pp. 4, 5; Townsend et al. 2024). The Agency maintains the ability to condition any proposed approval upon specific requirements for radiological monitoring and sampling, as deemed necessary.

In its December 2022 response to questions sent by EPA, Mosaic provided additional information on the consideration of groundwater, as well as its reasoning for focusing on sampling groundwater, rather than surface water or the unsaturated zone. Detailed information on initial modeling results and planned groundwater studies is included in *Beneficial Use of Mosaic Phosphogypsum* (Townsend et al 2024). Additionally, Mosaic will need to remain in compliance with the groundwater protection requirements of its wastewater permit with the state of Florida, in addition to the state's permitting requirements under the National Pollution Discharge Elimination System.

> *Element 3: Some discussion and documentation that the description of the project lies within generally accepted methodologies for such research, and that the proposed use is legitimate (i.e., not considered "disposal").*

Road construction using phosphogypsum was identified as a potential use for phosphogypsum at the time Subpart R was amended to allow the approval of alternate uses. The radiological risks from this use were evaluated by EPA in the background document to the amended rule (EPA 1992). The stated goal of the project is to demonstrate that phosphogypsum mixtures are able to meet the materials engineering specifications of the Florida DOT.

Legal requirements for a complete request are listed at 40 CFR 61.206(b), and included in Section III of this report, Scope of EPA's Review. Section B. 1. of Mosaic's 2022 request, *Components of the Petition*, lists relevant information for each requirement in the order that they are listed in §61.206 (Mosaic 2022a, p. 11). Appendix B of the EPA Workbook includes a completeness checklist. It is included below. Checklist items from the Workbook are listed in italics, each followed by the information provided by Mosaic relevant to that checklist item:

Petition Completeness Checklist

• *The name and address of the person(s) making the request*.

Patrick Kane, Vice President, EHS Enterprise Operations
13830 Circa Crossing Drive, Lithia, FL 33547

• *A description of the proposed use(s), including the following:*

A detailed description of the small-scale study (field test, control test, QA/QC Plans, illustrative diagrams/pictures)

Descriptions of the proposed project and tests are found in Mosaic 2023, Arcadis 2023, and Townsend et al. 2024. Key elements of the proposed project are summarized in the introductory section of this report and discussed in the technical review section.

How the phosphogypsum will be handled or processed during each stage of the study, including closure (if applicable)

Techniques used to blend the phosphogypsum with aggregate materials and construct the road are described in Mosaic 2022a, Appendix 9, *Radiological Risk Review*, page 3.

Goals of the study and how performance will be measured

"The purpose of the small-scale pilot is to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge construction." (Mosaic 2022a, p. 4)

Characteristics of the phosphogypsum to be used (radium-226 concentration, as defined below, as well as analyses of other characteristics of the waste such as toxic or hazardous constituents and mobility of constituents, presence of hazardous air pollutants)

Notice that the analyses described above exist, and provide those analyses to any potential user upon request.

Radium concentration in the source phosphogypsum is included in Mosaic2022a, Appendix 12, *New Wales Stack Data*. Information on radiological and non-radiologial parameters is included in Mosaic 2022b, Item 1, p. 2. Leach testing for non-radiological parameters has been performed and is described in Townsend et al. 2023.

• *The location of each facility, including suite and/or building number, street, city, county, state, and zip code, where any use, handling, or processing of the phosphogypsum will take place. If the mailing address is different, provide it too.*

Mosaic New Wales Stack, 3095 Hwy 640, W. Mulberry, FL 33860 (Mosaic 2022a, p. 11)
Map coordinates are included in Mosaic 2022a, Appendix 11, *Site Map – Location of Road* and Mosaic 2024b.

• *The quantity of phosphogypsum to be used by each facility.*

Identified in the revised Mosaic request as "approximately 1200 tons." (Mosaic 2023, p. 2)

• *The average concentration of radium-226 in the phosphogypsum to be used. This information may be available from the owner of the stack. The sampling must have been done within the past 12 months according to the procedures in 40 CFR 61.207. Include a copy of the necessary 40 CFR 61.208 certification with your petition.*

The Petition Completeness Checklist included in the guidance exceeds the legal requirements of the regulation; §61.206(b)(6) requires only "The average concentration of radium-226 in the phosphogypsum to be used" for purposes of the request. Mosaic has included summary data for Ra-226 sampling in Mosaic 2022a, Appendix 12, *New Wales Stack Data*. EPA has determined that these sampling results, as reported, are adequate for the purposes of reviewing the small-scale pilot project. More refined sampling is not required for the application, because the risk assessment scenarios reviewed by EPA are based on Ra-226 activity concentration values that are roughly double the average value reported by Mosaic. The conclusions of the risk assessment will remain valid even if the Ra-226 activity in the phosphogypsum that is used turns out to be higher. Should the project be approved, §61.206(d) requires that sampling that conforms with §61.207 must be performed on the actual phosphogypsum used for the project, and repeated annually for the duration of phosphogypsum removal from the stack.

• *A description of any measures which will be taken to prevent the uncontrolled release of radium-226, radon, or other hazardous constituents into the environment. This includes description of any monitoring plans for air and water pathways and worker exposure,leak prevention programs, and QA/QC measures.*

Handling of phosphogypsum is described in Mosaic 2022a, p. 12.

Appendix 10, *Proposed Monitoring Plan* (p. 4) describes radiological sampling including dosimetry, radon and radioactive particulate air sampling, and gamma rate measurements.

• *An estimate of the maximum individual risk and incidence associated with the proposed use, including the ultimate disposition of the phosphogypsum or any product in which the phosphogypsum is incorporated. Include a copy of the risk assessment procedures, assumptions, and results. If you use a non-EPA model, provide a copy of the model and all needed documentation to understand and use the model.*

As stated in Section 2, Scope of the Petition, "The Petition calculates the risk of the small-scale pilot road study by adjusting the risk determined in the October 2019 and April 7, 2020 TFI risk assessments based on the shorter duration of exposure for the pilot study. Mosaic adjusted the exposure times to reflect the exposures for the Pilot Study." Quantitative risk estimates are contained in Mosaic

2022a Appendix 9, *Radiological Risk Review*. EPA's review of the risk assessment is detailed in the section of this document titled "Results of EPA's Technical Review".

• *How the phosphogypsum will be handled at the study site, including procedures to prevent unauthorized access and handling of excess materials.*

The pilot project will be located on an access-controlled private industrial site. Section I, Components of the Petition, states that "Mosaic employees will handle all offloading of PG from the stack to trucks used to haul PG to road site. PG will be unloaded to a prepared staging area for mixing with aggregates as described in Section II and Appendix 9. All PG will be handled consistent with FDOT requirements for road construction" (Mosaic 2022a p.12). Techniques used to blend the phosphogypsum and construct the road are further described in Appendix 9, *Radiological Risk Review*, page 3. Section I additionally states that "Any unused phosphogypsum will be returned to the stack."

• *Description of the effectiveness and benefit of the proposed use.*

The stated purpose of the study is that it will establish whether phosphogypsum road construction can meet performance requirements regulated by FDOT: "The purpose of the small-scale pilot is to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge construction." (Mosaic 2022a, p. 4)

• *Description of any other Federal, state, and/or local requirements affected by the proposed use and how they will be satisfied.*

Beneficial use of phosphogypsum is currently regulated under the Florida Solid Waste Management Act, and approval will be required from the Florida Department of Environmental Protection for the pilot project to proceed. . (Mosaic 2022a, Section 9, p. 17, *Florida Beneficial Use Requirements*). This requirement may change due to the passage of Florida's H.R. 1191. Mosaic (2023) describes the changes as follows: "Under Florida's H.R. 1191, FDOT will determine whether PG is suitable for use in road construction aggregate. If that determination is made, by law, PG would be exempt from state regulation as a solid waste and would no longer require FDEP approval under the beneficial use regulations as explained in Section 9 and 10 of Mosaic's March 31, 2022 Petition. Under that scenario, PG would be allowed to be used as road construction aggregate consistent with applicable federal and other state regulations."

Mosaic has entered into a consent decree with the Florida Department of Environmental Protection and the U.S. EPA under the Resource Conservation and Recovery Act, which places additional requirements on the management, use, removal, placement and reuse of phosphogypsum in and from the New Wales stacks. The permissibility of removing phosphogypsum for the purposes of this pilot project under the consent order is technically and legally distinct from consideration of the request under 40 CFR Part 61 Subpart R, and is overseen by FDEP and the EPA Office of Enforcement and Compliance Assurance. Mosaic has informed EPA that it is seeking approval under the Subpart R NESHAP before seeking additional approvals (Mosaic 2022b).

• *Correspondence with Federal, State, County or municipal authorities charged with administering those requirements.*

Response to EPA September 9, 2022, Request for Information, Introduction (p. 1) describes preliminary interactions with FDEP regarding Mosaic's eventual request for regulatory approval.

• *Description of any recordkeeping and reporting procedures, including the certification requirements, and how they will be met.*

Basic recordkeeping requirements are described in §61.206(d). Record keeping and reporting requirements will be specified as conditions of EPA's approval, as deemed necessary.

• *Each request shall be signed and dated by a corporate officer or public official in charge of the facility.*

A signature page is included in the March 2022 Mosaic request (Mosaic 2022a) and in the 2023 revised request (Mosaic 2023). Both are signed by Patrick Kane, Vice President, Operations Services, North America.

Based on the results of this completeness review, EPA transmitted an updated[1] completeness determination to Mosaic on May 20, 2024.

[1] Based on a review of the request on March 31, 2022 (Mosaic, 2022a), and additional information provided on December 22, 2022 in response to EPA's questions (*Response to EPA September 9, 2022, Request for Information*), EPA transmitted a completeness determination to Mosaic on March 17, 2023 (EPA 2023).

VI. Results of EPA's Technical Review:

§61.206(b)(8) of Subpart R requires that any request include "An estimate of the maximum individual risk, risk distribution, and incidence associated with the proposed use, including the ultimate disposition of the phosphogypsum or any product in which the phosphogypsum is incorporated." The purpose of this risk assessment is to evaluate the request according to the legal threshold for potential approval: "The Assistant Administrator for Air and Radiation may decide to grant a request that EPA approve distribution and/or use of phosphogypsum if he determines that the proposed distribution and/or use is at leas[t] as protective of public health, in both the short term and the long term, as disposal of phosphogypsum in a stack or a mine." (40 CFR 61.206(c)) Risk, in this context, means the additional total risk of contracting a fatal cancer due to an individual's exposure to a carcinogen, in this case, radionuclides. This is additional, incremental risk beyond the risk due to background and other exposures. In the Federal Register notice associated with amendments to Subpart R, EPA interpreted an individual lifetime risk of fatal cancer risk of approximately 3×10^{-4} as a threshold for approving other uses of phosphogypsum. (57 FR 23311-23312, June 3, 1992). This means that if risk assessments show that a proposed use of phosphogypsum will not increase the fatal radiogenic cancer risk of any individual by more than 3 in ten thousand, or .03%, it meets regulatory requirements and may be approved.

As discussed above, the risk assessment and technical review are presented in terms of total risk of fatal radiogenic cancer. The general method for radiological risk assessment is to multiply the rate of exposure by the time of exposure, and then to multiply the total exposure by the risk per unit of exposure. Mosaic developed its risk assessment by adapting generic risk assessment scenarios for road use prepared by TFI to the proposed pilot project[2, 3]. As stated in the Mosaic request, "The risk assessment for this 2022 Mosaic Petition calculates the risk of the small-scale pilot road study by adjusting the risk determined in the TFI risk assessments to account for the shorter duration of exposure and smaller size of the pilot study (Mosaic 2022a, p. 5)." Mosaic informed EPA of its intention to use this approach prior to submitting this request, and EPA agrees with its fundamental validity; it is permissible to use conservative bounding calculations to demonstrate compliance with a risk threshold.

EPA has reviewed the technical materials submitted by Mosaic for completeness and for technical accuracy. EPA evaluated the risk assessment materials submitted in support of this request in a manner that is consistent with risk assessments previously performed in support of 40 CFR part 61, and with the EPA's established practices for radiological risk assessment. Although EPA conducted a detailed

[2] The original risk assessments may be found in "Radiological Risk Assessment in Support of Petition for Beneficial Use of Phosphogypsum," prepared by Arcadis, submitted as Appendix 2 to the TFI October 2019 request, and retained as Appendix 2 to TFI's April 2020 revised request (TFI, 2020).

[3] Although approval of the TFI request was rescinded, this decision was made on procedural and legal grounds: " …EPA decides that it was premature for the Agency to approve the proposed use without all of the information specified as constituting a proper request under § 61.206(b). …This decision is without prejudice to a subsequent or further proper request under § 61.206 for approval of the use of phosphogypsum for other purposes that contains the information required by § 61.206(b) 86 FR 35795."

review of TFI's generic risk assessment calculations for phosphogypsum in road construction[4], it did not "approve" them per se, but directly compared TFI's risk assessment results to risk assessments of road use scenarios developed by the EPA's 1992 Background Information Document (BID) for the final rule and drew conclusions for each exposure scenario. (EPA 2020). This review also compares the results from independent modeling approaches for applicable exposure scenarios to draw conclusions about the radiological risks from the use of phosphogypsum in the proposed pilot project.

Discussion of Parameters:

For the purposes of these risk assessment intercomparisons, several things should be noted:

Total risk: Stochastic risks from low levels of ionizing radiation are assumed to be directly proportional to dose, independent of dose rate. Total risks are developed first by calculating a rate of exposure risk per unit time of exposure, and then multiplying this by the duration of exposure. Throughout this report, risk estimates developed for an annual or lifetime exposure are scaled to reflect the actual exposure times that are expected to result from this pilot project. This is consistent with previous risk assessments for uses of phosphogypsum.

Road design: The dose rates in each exposure scenario depend on the geometry of the source. The road design proposed for this project is smaller than both of the road designs used to develop previous risk assessments (see Table 1 for project comparison). Road dimensions for the small-scale pilot project are described in Appendix 9 of the Mosaic request (Mosaic 2022a), and in Section 2.2 of Townsend et al. (2024).

Four test mixtures for road base will be evaluated. Per the original application, "In Mix design 1, PG will be blended with limerock (LR) sourced from an FDOT approved aggregate supplier (for B01 aggregate). In Mix design 2, PG will be blended with recycled concrete aggregate (RCA) sourced from a FDOT approved aggregate supplier (for B12 aggregate). The sources of the LR and RCA aggregates will be aggregate suppliers in the Tampa, Florida area….Mix design 3 will include PG (no more than 50%), sand, and Type I portland cement" (Mosaic 2022, Appendix 9). Mosaic revised its request to add an additional test section, in which the road base will be composed of no more than 50% PG mixed with reclaimed asphalt pavement (RAP) (Mosaic 2023).

The test sections of road will be 7.3 meters (24 feet) in width and 152.5 meters (500 feet) in length (see Figure 2). The road base containing phosphogypsum will be 25.4 centimeters (10 inches) in thickness, with a density ranging from 1.8-2.0 g/cm^3 (115- 126 lb/ft^3). 10 centimeters (4 inches) of asphalt pavement will not contain PG. The total amount of PG to be used is approximately 1200 tons (Mosaic 2023).

The road modeled in the 1992 BID included a road base that was 9.15 meters (30 feet) wide and 25 centimeters (9.8 inches) thick and a road surface 7.32 meters (24 feet) wide and 12 cm (4.9 inches) thick. In the BID, the road surface was assumed to be either concrete containing 15% phosphogypsum by weight, or asphalt containing no phosphogypsum, and the road base was assumed to be composed

[4] At that time, a technical contractor performed a detailed review of the dose and risk modeling performed, including parametrization, model calculations, and exploration of additional exposure scenarios (SC&A 2020).

of one part phosphogypsum by wieght and two parts of either sand or clay. The density of the road surface and road base were both assumed to be 2.25 g/cm^3.

The road modeled in the 2019 TFI request was a four-lane road with a road base and road surface both 15.24 meters (50 feet) wide. The thickness of the road base and road surface in the TFI request were 25 and 12 centimeters thick, respectively. The road surface was assumed to be concrete with 2.25% phosphogypsum by weight, and the road base was assumed to be composed of equal parts phosphogypsum and soil by weight. The density of the road surface and road base were both assumed to be 2.25 g/cm^3. The thicknesses and densities were the same as those in the 1992 BID.

While the BID and TFI risk assessments assume the presence of phosphogypsum in the concrete pavement, Mosaic's request indicates that phosphogypsum will not be incorporated into the asphalt pavement of the test project. Because the road proposed for the Mosaic pilot project is narrower, shorter, and contains no phosphogypsum in its pavement, the radiological exposures and risk calculations described in the following sections overestimate the actual risks associated with this pilot project to some degree.

Table 1: Variations in Road Designs between the 1992 BID, TFI Request, and Mosaic Request

Road Parameter	BID	TFI	Mosaic
Road Width	9.15 m (30 ft)	15.24 m (50 ft)	7.3 m (24 ft)
Base thickness	25 cm (9.8 in)	25 cm (9.8 in)	25.4 cm (10 in)
Base Density	2.25 g/cm^3	2.25 g/cm^3	1.85-2.02 g/cm^3
Surface Thickness	12 cm (4.9 in)	12 cm (4.9 in)	10 cm (4 in)
Composition	PG in base and surface	PG in base and surface	PG in base only
Percent PG by weight	15% in road surface, 33% in road base	2.25% in road surface, 50% in road base	Up to 50% in road base

Concentration of Ra-226: For these risk assessment scenarios, dose rates and risk may be scaled linearly based on the concentration of Ra-226 in the phosphogypsum used. The TFI risk assessment was based on an activity of 1 Bq/g (27 pCi/g), and Mosaic carried that assumption forward into its current request. EPA based its 2020 analyses on a Ra-226 concentration of 1.3 Bq/g (35 pCi/g), to be certain that the generic risk assessments would be inclusive of all domestic sources of phosphogypsum. In this document, the EPA also scaled each risk calculation to the higher concentration (i.e., 1.3 Bq/g) as the basis for the detailed discussion of each scenario. Mosaic's submission reports that the mean

concentration of Ra-226 in samples taken from its New Wales stack is .56 Bq/g (15.1 pCi/g) (Mosaic 2022a, Attachment 12), which will be confirmed by detailed analyses required by §61.207 should the project be approved. Because the risk assessments assume higher Ra-226 concentrations than the phosphogypsum proposed for use in the small-scale pilot project, the risk assessments contained in this document likely overestimate the actual risks associated with this pilot project.

Table 2, below, summarizes the risk ranges for the scenarios discussed above as calculated by both EPA and TFI:

Table 2: Total Risks from the Proposed Pilot Project

Scenarios (Exposure Duration)	Total Risk
Road Construction Worker	$< 2.0\times10^{-6}$
Truck Driver Transporting PG	2.7×10^{-7}
Road User (site employee)	$< 1.0\times10^{-6}$
Nearby Resident	$<1.0\times10^{-6}$

The Mosaic request quantitatively modeled exposure scenarios for a truck driver transporting phosphogypsum from the stack to the construction site and a road construction worker building the pilot project and qualitatively discussed the risk to a utility worker, a road user, the resident nearest the road, and a reclaimer (Appendix 9, Table 3). Each scenario is discussed below:

Truck Driver:

In Table 3 (Appendix 9, p. 8) Mosaic reports a 0.016 mSv (1.6 mrem) potential dose to a truck driver transporting phosphogypsum from the stack to the location of the pilot project. The basis of this estimate was scaling this scenario as presented in the 2019 TFI risk assessment from a five-year exposure to a one-month exposure; that is, a reduction in the total dose by a factor of 60.

A truck driver was not modeled in EPA's 1992 BID. The 2019 TFI risk assessment estimated the dose and risk to a truck driver transporting phosphogypsum to the road construction site by using MicroShield® to model direct exposure to a dose point one meter from the center of the front face (where the driver would be sitting), using a rectangular volume of the dimensions of the standard roll-off (5.2 meters long, 1.4 meters high and 2.1 meters wide), typical for a 20-ton dump truck. The volume was assumed to be filled with uncompacted phosphogypsum with a density of 1.12 g/cm^3 and a Ra-226 concentration of 1.0 Bq/g (27 pCi/g), in secular equilibrium with its decay products. The driver works for 2000 hours per year, with the truck full for half of that time (1000 hr). Shielding effects from the truck cab were not considered. The calculated dose to the driver was 0.186 mSv/yr (18.6 mrem/yr) for the one month of exposure during project construction assuming a Ra-226 concentration of 1.0 Bq/g (27 pCi/g), or a risk of 2.0×10^{-6} per year.

One month of exposure would result in a total risk of 2.1×10^{-7}. This is a conservative estimate, because shielding from the truck and cab is not taken into account. The total risk to a truck driver hauling

phosphogypsum for the purposes of constructing the small-scale pilot project is likely to be less than 2.1×10^{-7}, or three orders of magnitude below the acceptable risk threshold of 3×10^{-4}.

Construction Worker

In Table 3 (Appendix 9, p. 8) Mosaic reports a 0.018 mSv (1.8 mrem) potential dose to a worker constructing the pilot project. The basis of this estimate was scaling this scenario as presented in the 2019 TFI risk assessment from a five-year exposure to a one-month exposure; that is a reduction in the total dose by a factor of 60.

The 2019 TFI risk assessment estimated the dose to a road construction worker to be 11 microrem per hour (µrem/hr), assuming a Ra-226 concentration of 1.0 Bq/g (27 pCi/g). The doses are from direct exposure from gamma emission from PG, as well as inhalation and ingestion from potential dust emission during construction. The road construction worker moves around the surface of the road and the direct dose was calculated as the average of the dose at the road center and at the edge of the road. The risk estimate calculated in the TFI risk assessment was 5.5×10^{-5} for a five-year exposure, or an annual risk of 1.1×10^{-5}. The total risk for working one month to construct the pilot project, according to the TFI risk assessment, would be 9.2×10^{-7}.

The 1992 BID evaluated the dose and risk to a construction worker building the road from direct gamma exposure, and dust inhalation. The construction worker is assumed to work 2,000 hours per year. Scaled to 1.3 Bq/g (35 pCi/g), the direct external dose rate given by the 1992 BID for a construction worker would be .056 mGy/yr (56 mrem/yr), and the risk per year is estimated to be 2.0×10^{-5}. The contribution due to dust inhalation was considerably lower: scaled to 1.3 Bq/g (35 pCi/g), the risk per year of exposure from dust inhalation for humid and dry sites, respectively, was 1.1×10^{-7} and 3.0×10^{-7}. Assuming a dry site, for which the dust exposure would be greatest, the total combined risk for one month of work is 1.7×10^{-6}.

As described in the introduction to this section, these calculations likely overestimate risk from the proposed pilot project because they model a higher concentration of Ra-226 in road base than is proposed, the inclusion of phosphogypsum in the road surface, and a larger road footprint than the proposed pilot project. The total risk to a road construction worker constructing the small-scale pilot project will be less than 2×10^{-6}, two orders of magnitude below the acceptable risk of 3×10^{-4}.

Road User

Mosaic did not quantify the exposure to a road user. “Given the test road is on the Mosaic site, no public use or exposures are expected… consideration of other road users such as Mosaic workers traveling on the road is possible but would result in dose and exposures much less than those estimated in the 2019 risk assessment considering the PG containing portion of the road would be narrower and shorter than the road assessed in the 2019 risk assessment.” EPA concurs that the risk of public exposure to the road is low, but additionally reviewed risk assessments previously performed for road users.

The 1992 BID evaluated direct gamma exposure for a person regularly driving on the road constructed with phosphogypsum. Assuming that the automobile in which this person travels would provide some

shielding from direct gamma radiation, a shielding coefficient of 0.6 was applied. The 1992 BID estimated the external dose rate to be 0.026 0.0098 mGy/yr (2.6 and 0.98 mrem/yr) for Ra-226 concentrations of .96 and .37 Bq/g (26 and 10 pCi/g) in phosphogypsum, respectively, based on 250 hours of travel per year. Scaling these results to 1.3 Bq/g (35 pCi/g), the external dose rate inside the vehicle would be .035mGy/yr (3.5 mrem/yr). The 1992 BID estimated the risk per year from .96 and .37 Bq/g (26 and 10 pCi/g) in phosphogypsum, to be 9.6×10^{-7} and 3.7×10^{-7}, respectively. In EPA's 2020 review, lifetime risk for 30 years of exposure was reported as 3.9×10^{-5} (0.39 in 10,000).

The 2019 TFI risk assessment estimated the dose and risk to a road user (motorist or bicyclist) to be 1.1 mrem/yr assuming a Ra-226 concentration of 1 Bq/g (27 pCi/g). No shielding to the road user was assumed. The estimated risk for 26 years of exposure was 1.0×10^{-5}.

To quantify the difference in exposure times, traversing 2000 feet of road at twenty-five miles per hour takes 54 seconds (0.015 hours). To do so at ten miles per hour takes 136 seconds (.038 hours). To reach 250 hours of exposure would require 16,667 trips over the pilot project at 25 miles per hour, or 6,579 trips at 10 miles per hour - more than three trips per hour for the entirety of a 2,000-hour work year. Even if a worker was to traverse the pilot project several hundred times in the course of a year's work, her or his exposure and risk would be more than an order of magnitude less than was modeled in either the TFI or EPA risk assessments, that is, on the order of 1×10^{-6} or less.

Nearby Resident (Member of Critical Population Group)

The nearest resident is located 3.9 km (2.4 miles) from the road project and .805 km (.55mi) from an existing phosphogypsum stack (Mosaic 2024b).

The 1992 BID evaluated risks to a member of the critical population group (CPG), defined as a person living in a house located 100 or 1,000 meters from the road. Exposure pathways evaluated for the CPG included direct gamma exposure, ingestion of drinking water from a contaminated well, and ingestion of foodstuffs contaminated by well water. According to the modeling results in the 1992 BID, no radionuclides were calculated to reach an on-site well via the groundwater pathway for almost 10,000 years, so the risks from pathways other than direct gamma exposure were negligible.

The 1992 BID estimated the external dose rates to be 0.50 and 0.19 mrem/yr for Ra-226 concentrations of .96 and .37 Bq/g (26 and 10 pCi/g) in phosphogypsum, respectively. Scaling these results to 1.3 Bq/g (35 pCi/g), the external dose rate to the CPG member would be 0.67 mrem/yr. The 1992 BID estimated the risk per year from .96 and .37 Bq/g (26 and 10 pCi/g) in phosphogypsum, to be 1.6×10^{-8} and 6.2×10^{-9}, respectively. Scaling these results to 1.3 Bq/g (35 pCi/g), the risk per year to a nearby resident is estimated to be 2.2×10^{-8}. The lifetime risk for 30 years of exposure would be 6.6×10^{-7} (0.0067 in 10,000).

The 2019 TFI risk assessment estimated the dose and risk to a nearby resident for a time duration of 26 years to be 72.8 and 20.0 mrem for residents living 6.1 meters and 15.2 meters (20 feet and 50 feet), respectively, from the road. These doses correspond to total risks of approximately 5.0×10^{-5} (0.5 in 10,000) and 1.0×10^{-5} (0.1 in 10,000).

Risk estimates for the nearby resident are driven by direct exposure to gamma radiation. As distance to the source increases, dose to the receptor is reduced at an exponential rate according to the inverse square law. The nearest resident is 3.9 km (2.4 miles) from the road project and members of the public do not access the facility. TFI calculated the lifetime risk of a resident living 6 meters from a road containing phosphogypsum to be 5.0×10^{-5}. EPA estimated the lifetime risk for someone living 100 meters from a road containing phosphpgypsum as 6.6×10^{-7}. Provided that the pilot project is constructed as described, the lifetime risk to the nearest resident due to the pilot project would be several orders of magnitude less than either of these estimates. Any risk to the nearest resident from phosphogypsum would be caused primarily by the volume of phosphogypsum remaining on the stack, supporting the concept that inclusion of phosphogypsum in the pilot project is "at least as protective" as maintaining it in the nearby stack.

Scenario 4: Reclaimer

The future resident, or reclaimer, scenario represents a worst-case environmental exposure scenario in which, at some point in the future, the road is disused, partially dismantled, and a person resides full-time on the residual phosphogypsum in a structure without controls for indoor radon.

In the 1992 BID risk assessment, a reclaimer is assumed to build a house on the roadbed at some future time after the road is closed and the road surface has crumbled and been removed, and the potential risk to a future resident was calculated to be significantly above the acceptable risk of 3×10^{-4}. TFI presented an alternate scenario in which construction techniques, favorable radon transport conditions, and a lower residence time on the site resulted in a lower lifetime cancer risk to the reclaimer, 4.0×10^{-5} (0.4 in 10,000) for an exposure time of 26 years, compared to the 1992 BID estimate of 3.5×10^{-3} (35 in 10,000) for an exposure time of 30 years. In reviewing the TFI risk assessment, the Agency determined that the scenario modeled by TFI did demonstrate that the risk to a future member of the public depends on the methods used to construct the house and might be less than estimated in the 1992 BID, but found that more pessimistic scenarios are also possible. Because the future reclaimer scenario could potentially still present lifetime risks above the Agency's defined threshold of 3×10^{-4}, EPA concludes that it cannot be dismissed out of hand. "To ensure that the risk to members of the public in the future is not above the acceptable risk, the redevelopment of any abandoned roads as anything other than a road constructed in accordance with this risk assessment should not be undertaken until an additional site-specific risk assessment demonstrates that risks to members of the public are acceptable." (EPA 2020)

Mosaic declined to evaluate the reclaimer scenario, because "Given the size of the proposed test road and the observation that the test road will be constructed on Mosaic property, a reclaimer scenario is not reasonably plausible." EPA agrees that the location of the pilot project changes the consideration of the reclaimer scenario. The pilot project is proposed to be located on a large, privately-owned industrial site, on land which has been mined for phosphate ore and reclaimed. The pilot project site is located in the immediate proximity (.805 km) of an existing phosphogypsum stack. Should the site ever be developed for a different use, radiological risk due to the presence of phosphate ore, phosphogypsum, and other phosphate production residuals will have to be carefully considered, along with other risks inherent to any former industrial site. Removing the proposed quantity of phosphogypsum from the stack and using it in the proposed pilot project on the same site would not

significantly change site characteristics or create additional risk to a future trespasser, reclaimer, or other member of the public.

Although EPA finds the proposed pilot project is permissible under §61.206, this does not imply any conclusions about the risks to future reclaimers at other sites, which may be further from phosphogypsum stacks and may lack the institutional controls present at the Mosaic facility. EPA will consider these scenarios as part of any subsequent request for any use proposed to take place outside the Mosaic property.

VII. Other Considerations

Water Pathway

In its 2020 review of the TFI risk assessments, the EPA noted that although "potential radiological risks due to leaching and water transport are [generally] low, compared to the risks posed by direct gamma exposure and the inhalation of radon gas … water transport is an area of considerable uncertainty. The mobility of metals and radionuclides will likely depend on many site-specific factors, such as the sorption properties of local soils, the amount of precipitation that occurs in an area, and the depth to groundwater. The presence of karst aquifers or the formation of colloids could lead to enhanced transport, and microbes and other biota have the potential to alter radionuclide mobility." In other words, although generic modeling results performed for the 1992 BID[5] and during the review of TFI's submission[6] (SC&A 2020, Section 5.3) do not identify a scenario in which phosphogypsum road construction is expected to result in significant impacts to surface or groundwater, site-specific conditions must always be considered.

In the case of this proposed pilot project, placement of the phosphogypsum would be within an area subject to permitted groundwater protection and monitoring requirements. The facility will need to remain in compliance with those permit requirements.

At the request of EPA, the facility provided additional details on the hydrogeology of the site (Mosaic, 2022b) and the groundwater monitoring to be performed (Townsend et al. 2024). A minimum of eighteen months of groundwater monitoring is proposed, with quarterly sampling for pH, specific conductance, total dissolved solids, calcium, sodium, sulfate, and gross alpha. If an increase is noted in

[5] The 1992 BID estimated the committed dose rate from ingestion of river water contaminated by surface runoff to be 0.020 and 0.0076 mrem/yr for Ra-226 concentrations of 0.96 and 0.37 Bq/g (26 and 10 pCi/g) in phosphogypsum, respectively. Scaling these results to 1.3 Bq/g (35 pCi/g), the committed dose rate from ingestion of foodstuffs grown onsite would be 0.027 mrem/yr. The 1992 BID estimated the risk per year from ingestion of foodstuffs grown onsite from 0.96 and 0.37 Bq/g (26 and 10 pCi/g) in phosphogypsum, to be 1.5×10^{-9} and 5.9×10^{-10}, respectively. Scaling these results to 1.3 Bq/g (35 pCi/g), the risk per year is estimated to be 2.0×10^{-9}. The lifetime risk from external radiation for 30 years of exposure would be 6.0×10^{-8}. According to the 1992 BID, no radionuclides were calculated to reach an on-site well via the groundwater pathway for almost 10,000 years.

[6] In this analysis, SC&A assumed that the road base was not covered by pavement and therefore was open to infiltration for the duration of the modeling. The analysis varied the distance from the road to the well from 15.2 m to 100 m and used multiple sets of distribution coefficients for the radionuclides of concern – conservative defaults found in the code, average values, and values itended to reflect sandy soil. None of these cases resulted in a total risk in excess of 3×10^{-4} for a 26-year exposure.

any of these parameters, analysis will be performed for radium, uranium, arsenic, cadmium, chromium, and lead. EPA agrees that this environmental sampling program, if performed correctly, may increase the understanding of the mobility of both radiological and non-radiological components of phosphogypsum. However, EPA also notes that any conclusions drawn based on this groundwater monitoring would be limited to the timeframe over which the monitoring is conducted. Thus, the eighteen-month sampling duration proposed by Mosaic may not neccessarily be sufficient to support conclusions about longer term use in a full-scale project.

Non-radiological Solid Waste Considerations:

Under Subtitle D of the Resource Conservation and Recovery Act (RCRA), states have the primary authority to implement and enforce standards for management of non-hazardous industrial solid wastes, including whether or not to allow a proposed beneficial use. The request submitted by Mosaic was described as seeking separate approval of the small-scale pilot project by the Florida Department of Environmental Protection (FDEP) following EPA's review under the Subpart R NESHAP. On May 1, 2022, the Florida legislature passed a bill, HB 1191. The bill directs FDOT to study the use of phosphogypsum in roads, and exempts uses of phosphogypsum from review by FDEP. The FDEP regulates beneficial use under Florida Administrative Code (FAC) 62-701 and Part IV of Chapter 403 Florida Statutes, Solid Waste Management Act. Industrial by-products are regulated as solid waste unless otherwise exempted.: "Phosphogypsum …used in accordance with … an express United States Environmental Protection Agency approval for the specific use is not solid waste as defined in s.403.703 and shall be an allowed use in this state." However, review by FDEP is still required until FDOT issues a determination that phosphogypsum is suitable for use in road construction.

EPA developed both the the "Methodology for Evaluating the Beneficial Use of Industrial Non-Hazardous Secondary Materials" (EPA 2016a) and "Beneficial Use Compendium: A Collection of Resources and Tools to Support Beneficial Use Evaluations" (EPA 2016b) to aid states and others in making beneficial use decisions. As part of that document, EPA defined beneficial use as the substitution of a non-hazardous industrial material, either as generated or following additional processing, for some or all of the virgin, raw materials in a natural or commercial product in a way that provides a functional benefit, meets relevant product specifications, and does not pose concerns to human health or the environment. (Note that the "non-hazardous" designation is based on a material's regulatory status. Non-hazardous materials may still pose risk). Uses that do not meet these criteria may be considered improper disposal of a solid waste under federal law, and federal action could be taken if there were a finding of imminent or substantial endangerment, even in cases where the state has determined the material to not be subject to state regulation. A radiological risk assessment is not a substitute for a complete consideration of environmental health and safety.

The current proposed pilot project takes place on an existing industrial facility. It is of small scale and occurs at a significant distance from members of the public and is under environmental regulatory oversight at the facility. Mosaic committed in its request to conduct environmental sampling and study of both radiological and non-radiological parameters as part of the pilot project.

VIII. Summary and Conclusions

The purpose of this review was to evaluate, via the process identified in 40 CFR §61.206, whether the request and risk analysis submitted by Mosaic were sufficient to demonstrate that the project as

proposed fell below risk thresholds previously defined by EPA for approval of other uses of phosphogypsum. Review of the Mosaic request was performed by a technical team led by the Radiation Protection Division in consultation with other EPA program offices.

The Agency's review found that Mosaic's request is complete, that its risk assessment was technically acceptable, and that potential risks from the proposed project fall within the regulatory requirements of 40 CFR §61.206. Numerical estimates of the total lifetime risks indicate that the additional risk of fatal cancer to workers moving phosphogypsum and constructing the road will be less than 2×10^{-6} (2 in 1,000,000, or .0002%) and risk to the nearest members of the public from the project are lower than 1×10^{-6} (1 in 1,000,000, or .0001%) provided that the project is constructed as described in Mosaic's request. Therefore, the small-scale pilot project may be approved by the Agency per 40 CFR §61.206. An approval by the Assistant Administrator of Air and Radiation applies to this specific pilot project, and indicates only that the project meets the requirements of the Subpart R NESHAP. Approval does not relieve Mosaic from responsibility to comply with other applicable laws and regulations.

IX. References

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Appendix A:

Summary of Generic Risk Assessments: Parameters and Results

Tables 1 and 2 summarize annual risks calculated by TFI in its risk assessment, and by EPA in its 1992 BID, respectively, for various scenarios associated with use of phosphogypsum in road construction. The lifetime risk of fatal cancer associated with the exposure is listed in the rightmost column. A value of 3×10^{-4} would be denoted as 3.0 in the "Lifetime Risk" column of these tables.

Table A-1: Summary Table of Results for the 2019 TFI Risk Assessment

2019 TFI Scenarios[1] for 1.0 Bq/g (27 pCi/g)[2]	Lifetime Risk per Year of Exposure[3]	Years of Exposure	Lifetime Risk[4] (x 10^{-4})
Road Construction Worker	1.0E-05	5 to 20	0.5 to 2.0
Truck Driver	1.0E-05	5 to 20	0.5 to 2.0
Road User (Motorist/Bicyclist)	3.8E-07	26 to 70	0.1 to 0.3
Nearby Resident	3.1E-07	26 to 70	0.08 to 0.22
Utility Worker	4.0E-07	1 to 5	0.0 to 0.02
Reclaimer	1.5E-06	26 to 70	0.4 to 1.1

[1] See "Radiological Risk Assessment in Support of Petition for Beneficial Use of Phosphogypsum, Prepared for The Fertilizer Institute," October 2019 (Arcadis, 2019).
[2] Average concentration of Ra-226 in the phosphogypsum prior to its use
[3]Estimated from the reported risk and exposure time in the risk assessment
[4]Number of estimated fatal cancers if 10,000 people were exposed to this scenario. The lifetime risk per year of exposure multiplied by the years of exposure produce the lifetime risk for each scenario.

Table A-2: Summary Table of Results for the 1992 EPA BID

1992 BID Scenarios[1] for 0.96 Bq/g (26 pCi/g)[2]	Lifetime Risk per Year of Exposure	Years of Exposure	Lifetime Risk (x 10^{-4})
Construction Worker - No Shielding - Direct Gamma	1.5E-05	5 to 20	0.75 to 3.00
Construction Worker - With Shielding - Direct Gamma	9.0E-06	5 to 20	0.45 to 1.80
Construction Worker - Humid Site - Dust Inhalation	8.4E-08	5 to 20	0.00 to 0.02
Construction Worker - Dry Site - Dust Inhalation	2.2E-07	5 to 20	0.01 to 0.04
Person Driving on Road - Direct Gamma	8.2E-08	26 to 70	0.02 to 0.06
Member of CPG[3] - Direct Gamma	1.6E-08	26 to 70	0.00 to 0.01
Reclaimer - Direct Gamma	2.6E-05	26 to 70	6.8 to 18.2
Reclaimer - Humid Site[4] - Indoor Rn	5.9E-05	26 to 70	15.3 to 41.3

1992 BID Scenarios[1] for 0.96 Bq/g (26 pCi/g)[2]	Lifetime Risk per Year of Exposure	Years of Exposure	Lifetime Risk (x 10^{-4})
Reclaimer - Dry Site[5] - Indoor Rn	6.2E-05	26 to 70	16.1 to 43.4

[1]See EPA 402-R-92-002, *Potential Uses of Phosphogypsum and Associated Risks, Background Information Document*, Tables 4-15 and 4-16
[2]Concentration of Ra-226 in the phosphogypsum prior to its use
[3]Critical Population Group (Nearby Resident)
[4]Typical of a site in the southeastern United States
[5]Typical of a site in the southwestern United States

A summary of the scenarios included in the 1992 BID is provided in Table 3.

Table A-3: Summary of Scenarios Included in the 1992 EPA BID

	1992 BID Scenario	Scenario Description
1	Construction Worker	The construction worker is assumed to be engaged eight hours per day for 250 days per year in constructing a 16-kilometer section of road. Gamma exposures are calculated for a worker who is employed directly on the road surface and a worker who uses equipment such as a bulldozer or road grader which provides some shielding from shielding from gamma radiation. The shielding coefficient is 0.6.
2	Person Driving on Road	The person driving on the road is assumed to use the road from home to work, and return. This person travels the road one hour per day for 250 trips per year. The automobile in which this person rides provides some shielding from direct gamma radiation. The shielding coefficient is 0.6.
3	Member of the CPG (aka Nearby Resident)	The member of the CPG is assumed to live in a house located 100 or 1,000 meters from the road. Potential doses to a member of the CPG could result from direct gamma exposure or from the use of contaminated well water.
4	Reclaimer	The reclaimer is assumed to build a house on the roadbed at some future time after the road is closed and the road surface has crumbled and been removed. In addition to living in a house at the site, the reclaimer drills a well for water and plants a vegetable garden in the contaminated soil. The vegetable garden provides 50 percent of the reclaimer's foodstuffs.

A summary of the scenarios included in the 2019 TFI risk assessment is provided in Table 4.

Table A-4: Summary of Scenarios Included in the TFI Risk Assessment

TFI Scenario	Scenario Description
Road Construction Worker	This scenario assumes a road construction worker works directly on the surface of the road as it is being constructed, 2,000 hours/year for 5 years. Although some road construction workers are on equipment during the workday which would provide shielding from external gamma exposure, shielding has not been included in the calculations. The doses are from direct exposure from gamma emission from PG, and inhalation and ingestion from potential dust emission during construction. In all three conceptual site models (CSMs) the active road area is 100 m long by 15 m wide, while thicknesses vary with the CSM. As the model used was RESRAD, the exposure point is at one meter above the surface, the RESRAD default. In addition, it was assumed the road construction worker moves around the surface of the road and the direct dose was calculated as the average of the dose at the road center and at the edge of the road.
Road User (Motorist/Bicyclist)	Two road users were considered for this scenario, a driver and a bicyclist. In both instances they were assumed to travel on a final constructed road with PG in the road base and the paving. No reduction was provided to the driver as the floor and auto body shielding are assumed negligible given the current materials used thin plastic/metal.
Truck Driver	Another receptor is the truck driver who transports PG from the PG stack to the site of the road construction. The truck is assumed to be a standard dump truck. The dose to the truck driver was calculated using MicroShield®. The geometry selected was a rectangular volume, with the dimensions of the roll-off portion being 5.2 m long, 1.4 m high and 2.1 m wide which is the average for a 20-ton dump truck. The dose point was one meter from the center of the roll-off front face, where the driver would be sitting. The truck was assumed to be filled with phosphogypsum with a density of 1.12 grams per cubic centimeter (g/cm^3) which is somewhat lighter than soil. The isotopes in the PG were Ra-226 in secular equilibrium with the daughters. The activity was assumed 1.0 Bq/g (27 pCi/g) as the PG was not yet mixed with road surface material. No credit or reduction was taken for the shielding effects of the truck cab.

TFI Scenario	Scenario Description
Nearby Resident	This scenario assumes that a resident lives close to the site of the road as it is being constructed and after construction. In the first case, no shielding (road shoulders, etc.) was assumed during construction. After construction, a shoulder was established. During construction MicroShield® was used to determine the doses at various distances from the road. A rectangular volume was assumed, 15 m wide, 100 m long and 0.25 m thick. The contribution to the receptor is from the 25 cm thickness, 100 m long side face during construction and the 15m wide, 100m long surface of the road following construction. Doses were determined at 6.1 m and 15.2 m from the edge of the road at a receptor height of 1 meter above the road surface. The distance of 6.1 m is considered representative of urban settings with houses at a minimum separation from the road edge (urban setting may also have more shielding). The distance of 15.2 m is representative of more suburban setting where separation distances between roads and homes are expected to be greater.
Utility Worker	It was assumed that a trench was cut across the road. The utility worker was assumed to work in the middle of the trench about one meter from the face of the road. The dose point was 7.5 m from the road edge, 51 m from the road end and 0.25 m high. The isotopes in the PG were Ra-226 in secular equilibrium with the daughters. The activity was taken as 0.50 Bq/g (13.5 pCi/g) as the PG was mixed with road surface material at a 1:1 ratio. The direct exposure dose to the utility worker was calculated assuming the utility worker spends 160 hours per year in the PG road.
Reclaimer	The reclaimer scenario assumes that the home is a bungalow constructed slab on grade with a 16.2 cm underlying slab and a 16.2 cm gravel base underlying the slab. The basic scenario takes credit for a vapor barrier but takes no credit for any radon mitigation that might be required by local building codes. As with the case of the nearby resident, the house is presumed to be occupied for 26 years. In broad terms, the reclaimer scenario assumes the following: • Exposure to the reclaimer would be through gamma radiation and the inhalation of Radon (Rn-222) and progeny. • The reclaimer is assumed to be exposed for 26 years with approximately 75% of his/her time onsite and indoors.

TFI Scenario	Scenario Description
	The key assumptions are as follows: • The road surface has crumbled and has been removed as part of site preparation (50 years after closure also as assumed by the EPA in their 1992 BID). • Site grading for construction will almost certainly reduce the thickness of the layer containing PG; however, for present purposes, we have assumed that site preparation will reduce the PG layer to about 10 cm in thickness and the concentration of Ra-226 in the remaining layer to about .37 Bq/g (10 pCi/g). • Radon flux is reduced due to a 6-millimeter (mm) poly layer as a moisture barrier currently common in building codes. Such a layer would be expected to reduce the radon flux by at least a factor of 10.

Tab 5

E-DOCKET: EPA-HQ-OAR-2024-0446

REQUEST FOR APPROVAL OF USE OF PHOSPHOGYPSUM IN A SMALL-SCALE ROAD PILOT PROJECT ON PRIVATE LAND IN FLORIDA SUBMITTED BY MOSAIC FERTILIZER, LLC

RESPONSE TO COMMENTS

December 11, 2024

U. S. ENVIRONMENTAL PROTECTION AGENCY

Office of Radiation and Indoor Air

Radiation Protection Division

1200 Pennsylvania Ave., NW

Washington, DC 20460

Contents

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Acronyms and Abbreviations:

Bq	becquerel
CAA	Clean Air Act
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
EPA	Environmental Protection Agency
MIR	Maximum Individual Risk
NAS	National Academy of Sciences
NESHAPs	National Emissions Standard for Hazardous Air Pollutants
ORIA	Office of Radiation and Indoor Air
pCi	picocurie
PG	Phosphogypsum
Ra-226	Radium-226
RCRA	Resource Conservation and Recovery Act
RME	Reasonable Maximum Exposure
TFI	The Fertilizer Institute

Background:

Mosaic Fertilizer, LLC submitted a request for a Small-scale Road Pilot Project on Private Land in Florida in March 2022, and submitted a Revised Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project in August 2023. Mosaic has proposed to construct a small-scale pilot project at its New Wales facility in Polk County, Florida. Mosaic's plan is to construct four sections of test road having varying mixtures of phosphogypsum (PG) in the road base "to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge construction" (Mosaic 2022a). The pilot project will be constructed in the place of an existing facility road near the phosphogypsum stack, and the study will be conducted in conjunction with researchers from the University of Florida. All information related to this approval is available at E-Docket EPA-HQ-OAR-2024-0446 and on EPA's public website at https://www.epa.gov/radiation/phosphogypsum.

The EPA performed a review of Mosaic's request, documented in *Review of the Small-scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC* (EPA 2024a). The Agency found that Mosaic's request is complete per the requirements of 40 CFR 61.206(b). Further, the review found that Mosaic's risk assessment is technically acceptable, and that the potential radiological risks from the proposed project meet the regulatory requirements of 40 CFR 61.206(c); that is, the project is at least as protective of public health as maintaining the phosphogypsum in a stack. On October 9, EPA issued a conditional approval of the small-scale pilot project per 40 CFR 61.206, pending a 30-day public comment period, later extended to 45 days. This comment period closed on November 23, 2024.

EPA committed to review all public comments for their relevance to the pending request and determine if they contained information that would lead to a concern for human health or environmental impacts not previously considered, and work with the applicant to resolve significant adverse comments. The EPA noted that comments must be specific to the small-scale pilot project as it is described in Mosaic's request and the EPA's pending approval. This document is the response to public comments received on the topic of this pending approval. The EPA's complete process of soliciting and addressing comments is described in Section 2.4 of *Applying to EPA for Approval of Other Uses of Phosphogypsum: Preparing and Submitting a Complete Petition Under 40 CFR 61.206, A Workbook* (EPA 2005).

Summary:

EPA received 91 discrete comments. One comment was in favor of conducting the pilot study, and the remaining 90 were opposed. Three of the comments opposing the project consisted of electronic petitions. Including signatories of these electronic petitions, EPA received a total of 22,112 comments.

The majority of comments (67 of 91) were generally opposed to the use of phosphogypsum in public roads and critical of the current state of phosphogypsum management. Many opposed the approval of Mosaic's pilot project on the basis that it would set a precedent or facilitate additional road uses. These comments were determined to be outside the scope of this decision, which is specific to the small-scale pilot project as it is described in Mosaic's request. The EPA's approval

applies only to the proposed pilot project and not to any broader use. Any other use would require a separate application, risk assessment, and approval.

Comments related to EPA's management of phosphogypsum and its non-radiological contaminants under the Resource Conservation and Recovery Act and other statutes similarly fall outside the scope of the current decision. EPA has documented other regulatory issues in its supporting documents, but EPA's determination here is specific to the permissibility of the project under the Clean Air Act National Emissions Standards for Hazardous Air Pollutants for Radionuclides under 40 CFR 61.206(c). It does not relate to any other regulatory approval or determination of compliance. These must be obtained or made separately from this decision.

Some commenters indicated that EPA established a legal ban on the use of phosphogypsum in road construction by considering it, and not issuing a categorical approval, in 1992. Road use is not prohibited by the regulation as amended in 1992 and is eligible to be considered as an "other use."

Commenters were critical of many aspects of the risk assessment. Commenters questioned the EPA's overall ability to perform radiological risk assessment, use of fatal radiogenic cancers as a health endpoint, selection of dose and risk coefficients, selection of models, and selection of exposure scenarios and whether current risk data was used. Specifically, several commenters believed that greater emphasis should be placed on the consideration of a future resident at the site of the pilot project. The topics raised in comments had been considered in EPA's technical evaluation. These comments represent disagreements with decisions that EPA has made in its evaluation of potential risks associated with the proposed pilot project, rather than new information that the Agency has not previously considered. The EPA believes that the risk assessments associated with this pilot project are appropriate for the project, consistent with current radiological risk assessment methodologies and precedent, and sufficient to evaluate the project per the requirements of 40 CFR 61.206. EPA believes that for this existing site, it is most appropriate to consider the potential risk to site workers and the nearest residents to the site when determining whether the pilot project is as protective as leaving the phosphogypsum in the stack. EPA's review is based upon multiple risk assessments that rely on different models and have been extensively reviewed. Results from multiple modeling efforts yield similar numerical results and show that potential risks due to the proposed pilot project are low.

Specific Issues:

Below, EPA has summarized public comments by topical area. For each topic, EPA has provided its response. Topics raised by individual comments are listed in the Appendix to this document.

Issue 1: Requests for Extension of the Public Comment Period

Many commenters requested extension of the comment period, noting the impacts of Hurricanes Helene and Milton on Florida.

EPA Response:

In response to these requests, the EPA extended the comment period for 15 days to account for interruptions due to the hurricane. Although the regulations do not require solicitation of public comment for this small-scale pilot project, the EPA has followed the public outreach procedures

specified in its guidance for other use requests (EPA 2005). Additionally, prior to its proposed decision and in response to public and media interest, the EPA published all application materials from Mosaic related to the pilot project on its public website. Mosaic's complete application materials have been publicly available since February 2024. For these reasons, the EPA believes that it has provided sufficient opportunity for public comment.

Issue 2: General Opposition to the Use of Phosphogypsum in Road Construction

A majority of the comments received expressed general opposition to the use of phosphogypsum in public roads, and many were concerned that this pilot study is a first step towards the widespread use of phosphogypsum in roads. Many commenters were critical of the current management of phosphogypsum, referring to vulnerability to natural disasters and to the possibility of sinkholes.

EPA Response:

These are policy concerns which fall outside the scope of the current decision. Under 40 CFR Part 61 Subpart R, the EPA may decide to grant a request for approval of distribution and/or use of phosphogypsum if it determines that "the proposed distribution and/or use is at leas[t] as protective of public health, in both the short term and the long term, as disposal of phosphogypsum in a stack or mine." 40 CFR 61.206(c). Here, the EPA's decision is limited to the proposed pilot project located on an existing industrial site. Radiological risk assessments specific to this project show that the proposed project is at least as protective of public health as disposal of phosphogypsum in a stack, which is the current practice at this site. (EPA 2024a)

Issue 3: Permissibility of Road Construction as an "Other Use"

Several comments stated that EPA previously prohibited the use of phosphogypsum in roads, and that this approval represents a reversal of that legal prohibition, in violation of the Clean Air Act and Administrative Procedure Act. One comment specifically stated that "Mosaic's application is not properly a request for an 'other purpose' of phosphogypsum within the meaning of 40 C.F.R. 61 Subpart R because EPA already determined road use presented an unreasonable risk to public health."

EPA Response:

This is not a correct characterization of the regulations, which make no mention of road use. The 1989 rules only allowed phosphogypsum to be disposed of in stacks, which was the prevailing practice at the time, to control its distribution. The EPA granted reconsideration of this portion of Subpart R and, in 1992, amended Subpart R to allow distribution and use of phosphogypsum for outdoor agricultural purposes, for indoor research and development, and for "other purposes," with prior approval by the EPA on a case-by-case basis. 57 FR at 23305.

The EPA used a dose assessment model to evaluate the incremental increases in the maximum individual lifetime risk (MIR) associated with uses of phosphogypsum in agriculture, road construction, and research and development activities. The EPA modeled risks from road construction to the construction worker, road user, resident near the road, and the "reclaimer" scenario, in which the road is abandoned and a future resident lives directly on the road base that contains phosphogypsum, with the pavement removed. (EPA 1992) In its 2020 approval of a request by The Fertilizer Institute (TFI), EPA stated the following:

"As initially promulgated, Subpart R required 'stacking' and did not authorize alternative uses of PG. In 1992, the EPA amended Subpart R to categorically authorize use of PG for agricultural or research and development purposes under certain circumstances and to establish a procedure to request approval of other uses of PG. See 57 Fed. Reg. 23305 (June 3, 1992). At that time, the EPA considered also categorically authorizing the use of PG in road construction, but the EPA decided not to do so because it concluded that 'the use of phosphogypsum in road construction presents an unacceptable level of risk to public health.' Id. That determination largely was based on a concern about the risks to people living in a house constructed on land where roads built using PG once existed. The EPA did not necessarily foreclose any or all use of PG in road construction, but simply declined, at that time, to categorically authorize - as for agricultural or research and development uses - use of PG in road construction." (EPA 2020)

Although the decision was ultimately withdrawn on the basis that TFI never submitted a specific, and therefore complete, application, the withdrawal stated that "This decision is without prejudice to a subsequent or further proper request under § 61.206 for approval of the use of phosphogypsum for other purposes that contains the information required by § 61.206(b)." 86 FR 35795, July 7, 2021. Although few uses have been proposed, and none have completed the approval process, individual road applications are eligible to be proposed and reviewed as other uses of phosphogypsum under Section 61.206 of the regulation.

Issue 4: Concerns Under Statutes Other than the Clean Air Act

Several commenters made general statements about the pilot project, road uses of phosphogypsum, or phosphogypsum management posing threats to water quality. Other commenters raised concerns related to the non-radiological constituents of phosphogypsum, and the treatment of phosphogypsum under the Resource Conservation and Recovery Act (RCRA).

EPA Response:

EPA summarized general issues related to the water pathway and phosphogypsum road use in Section VII of its review document (EPA 2024a). The pilot project will take place on an existing permitted facility, and "Mosaic will need to remain in compliance with the groundwater protection requirements of its wastewater permit with the state of Florida, in addition to the state's permitting requirements under the National Pollution Discharge Elimination System" (EPA 2024a, p 9). EPA has likewise documented RCRA and solid waste concerns in Sections V and VII, respectively, of its technical review (EPA 2024a). The current approval is based on a determination of whether the pilot project meets the requirements of 40 CFR 61.206. As stated in the approval letter, "This approval does not relieve Mosaic from responsibility to comply with all other federal, state, or local laws, regulations, or restrictions on the use of phosphogypsum." (EPA 2024b).

Several other topics were raised by a more limited number of commenters.

Issue 5: Criticism of EPA's Risk Threshold

One commenter stated that by basing its decision on the potential risk of fatal cancer, EPA ignores other effects of ionizing radiation. Other commenters criticized EPA's numerical risk threshold. Specifically, one commenter stated that to meet the regulatory requirement of being "at least as protective" of disposal in a mine or stack, other uses must have a risk of $9x10^{-5}$ or less, because this

was the greatest risk calculated for a stack at the time of EPA's rule. Other commenters stated that EPA's risk threshold of up to $3x10^{-4}$ is triple what is permissible under the Clean Air Act, and one commenter incorrectly attributed the source of EPA's risk threshold to its 2005 Workbook.

EPA Response:
EPA's consideration of risk is consistent with its previous actions related to the radionuclide NESHAPs and is similarly consistent with the Agency's overall risk management policies. Specifically, when the radionuclide NESHAPs were promulgated, EPA considered all health effects from radiation, including non-fatal cancers, hereditary effects, and developmental effects. (54 FR 51659) The EPA selected fatal cancer risk as a risk assessment metric. "The Administrator believes that a [maximum individual risk (MEI) of fatal cancer over a 70-year lifetime] of approximately 1 in 10 thousand should ordinarily be the upper end of the range of acceptability. As risks increase above this benchmark…they then would be weighed with the other health risk measures and information in making an overall judgement on acceptability. …These include the overall incidence of cancer or other serious health effects within the exposed population." (54 FR 51656)

EPA's definition of the presumptively safe level under the CAA, and its application to other uses of phosphogypsum, has been consistent since the 1992 revision to allow the consideration of other uses:

"…EPA has determined that the risks represented by uses of phosphogypsum in which the MIR does not exceed the presumptively safe level of approximately $1x10^{-4}$ are acceptable. In earlier radionuclide NESHAP rulemakings implementing the criteria in the Administrator's benzene decision, EPA determined that in some instances that emissions corresponding to estimated maximum individual lifetime risks as high as $3x10^{-4}$ were acceptable. In the case of phosphogypsum, considering all of the information available on potential exposures and the associated risks, as well as the uncertainties inherent in deriving risk estimates, EPA has concluded that certain uses of phosphogypsum may be considered acceptable so long as those uses are restricted to limit the estimated lifetime risk to any individual to no more than 3 in 10 thousand." 54 FR 23311 Wednesday, June 3, 1992.

In this case, risks posed by the proposed pilot project are less than 1% of this decision threshold. "Numerical estimates of the total lifetime risks indicate that the additional risk of fatal cancer to workers moving phosphogypsum and constructing the road will be less than 2×10^{-6} (2 in 1,000,000, or .0002%) and risk to the nearest members of the public from the project are lower than 1×10^{-6} (1 in 1,000,000, or .0001%) provided that the project is constructed as described in Mosaic's request." (EPA 2024a)

Issue 6: Criticism of EPA's Risk Models and Methodology
One commenter called into question radiological risk models used by the International Commission on Radiological Protection (ICRP) and the US regulatory community. The same commenter questioned the validity of the dose and risk models used in 1992 and suggested that forthcoming EPA guidance (Federal Guidance Report 16) should be used.

EPA Response:
The risk analysis submitted by Mosaic is based upon the generic risk assessment scenarios previously submitted by The Fertilizer Institute (TFI) in 2019 to support road construction projects that could vary

in location and design. EPA evaluated the current submission in the context of previous risk assessments, in particular those included in the background document "Potential Uses for Phosphogypsum and Associated Risks" (EPA 1992), and analyses performed on EPA's behalf to evaluate the TFI request (SC&A 2020). Dose and risk coefficients change with the state of research, and it is correct to note that risk assessments performed at different times use slightly different values.

The risk assessments used by Mosaic were developed for TFI and use a dose-to-risk conversion factor for fatal cancers of .05/Sievert (Arcadis 2019). This value is consistent with National Academy of Sciences (NAS) report Health Risks from Exposure to Low Levels of Ionizing Radiation, BEIR VII Phase 2 (NAS 2006), and EPA Radiogenic Cancer Risk Models and Projections for the U.S. Population, (EPA 2011). The current generation of EPA's Federal Guidance reports, which provide updated radionuclide-specific dose coefficients (including FGR 16, which is currently undergoing review by EPA's Science Advisory Board) are consistent with BEIR VII recommendations.

The 1992 risk assessment used dose and risk conversion factors specific to each radionuclide, given in Table 4-4 (EPA 1992). These factors were taken from a previous generation of EPA guidance and rely on older NAS recommendations. Despite differences in dosimetry, the results for these risk analyses agree closely with updated risk analysis (EPA 2024a, Appendix A). In its review of TFI's risk assessments, SC&A (2020) showed that the use of dose conversion factors taken from EPA's 2019 Federal Guidance Report 15 did not result in significant differences to the calculated risks. Considering that the total risks from the project are expected to be less than 1% of threshold for approval, uncertainty in dose and risk factors does not challenge the overall conclusions of the risk analysis.

Issue 7: Criticism of Risk Assessment Scenarios

Commenters were critical of the scenarios used to calculate risks from the pilot project. Some commenters asserted that EPA should have considered a longer duration of exposure for workers, and other exposure scenarios such as removing phosphogypsum from the stack, and performing maintenance activities on the pilot project road. Commenters also asserted that the decision should be based on possibility of a future resident on the site of the pilot project, also called the "reclaimer" scenario. One commenter, based on materials submitted by Mosaic, was concerned that EPA based this decision upon the Reasonably Maximal Exposure (RME) rather than the Maximum Individual Risk (MIR).

EPA Response:

EPA agrees that MIR is the appropriate basis for evaluating the risk due to other uses of phosphogypsum and believes that it has been correctly applied. MIR is defined as the fatal risk of cancer over a 70-year lifetime exposure (54 FR 51656). To develop the regulations, EPA evaluated the risks to existing populations based on their physical locations relative to sources. "In attempting to make these estimates, EPA has tried at all times to give 'best estimates' of radionuclide concentrations in the environment and individual and population risks… EPA has not estimated the maximum conceivable risks that may result from the facilities analyzed at some point in the future." (54 FR 51661)

EPA's technical review, *Review of the Small-scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC* section VI, considers total risks to site workers and nearby residents (EPA 2024a). EPA addresses the reclaimer scenario:

"The pilot project is proposed to be located on a large, privately-owned industrial site, on land which has been mined for phosphate ore and reclaimed. The pilot project site is located in the immediate proximity (.805 km) of an existing phosphogypsum stack. Should the site ever be developed for a different use, radiological risk due to the presence of phosphate ore, phosphogypsum, and other phosphate production residuals will have to be carefully considered, along with other risks inherent to any former industrial site. Removing the proposed quantity of phosphogypsum from the stack and using it in the proposed pilot project on the same site would not significantly change site characteristics or create additional risk to a future trespasser, reclaimer, or other member of the public." (EPA 2024a)

The risk assessments show that the total lifetime risks to workers, site users, and to the nearest residents are low. Based on the technical evaluations, the EPA has determined that for an existing industrial site with institutional controls, these individuals, and not a hypothetical reclaimer at some time in the future, best represent the MIR.

Issue 8: Model Selection

One commenter criticized the use of the RESRAD model to develop the risk estimates used by Mosaic and suggested that EPA should use the Superfund PRG calculator. The commenter also made a statement that RESRAD is not peer reviewed.

EPA Response:

No specific model is required by the regulation, and Section 5.2 of the Workbook indicates that model selection is the responsibility of the applicant. RESRAD is a code developed by Argonne National Laboratory. It is extensively used for radioactive site remediation, and verification and benchmarking peer review reports on RESRAD are readily available.

The EPA relied on several models to evaluate Mosaic's application to reach its technical conclusions. As noted by commenters, the risk analysis used by Mosaic, which had originally been developed for TFI, employed RESRAD. TFI's risk assessment results were independently reviewed by a contractor, including alternate model runs and hand calculations (SC&A 2020). EPA compared these results with risk assessments performed using the MICROSHIELD and PATHRAE models for the 1992 rule, and the risk results for similar exposure scenarios agree closely (EPA 2024a, Appendix A).

Issue 9: Radium Sampling

One commenter asserted that the information provided by Mosaic regarding the radium-226 concentrations in the phosphogypsum to be used did not comply with the sampling requirements of §61.207 and, therefore, the results were invalid and cannot be used. The same commenter objected to EPA's use of higher than expected concentrations of radium-226 in the risk assessment as a bounding calculation.

EPA Response:

The regulation does not set requirements for radium analysis for purposes of the application. 40 CFR 61.206(b)(6) requires "[t]he average concentration of radium-226 in the phosphogypsum to be used" for purposes of the request. Mosaic has included summary data for Ra-226 sampling in Mosaic 2022a, Appendix 12, *New Wales Stack Data*. EPA has determined that these sampling results, as reported, are adequate for the purposes of reviewing the small-scale pilot project. More refined sampling is not required for the application, because the risk assessment scenarios reviewed by EPA are based on Ra-226 activity concentration values that are roughly double the average value reported by Mosaic. EPA deliberately overestimated the concentration of Ra-226 so that the conclusions of the risk assessment will remain valid even if the Ra-226 activity in the phosphogypsum that is used turns out to be higher than the preliminary data submitted by Mosaic. When a project is approved, §61.206(d) requires that sampling that conforms with §61.207 must be performed on the actual phosphogypsum used for the project and repeated annually for the duration of phosphogypsum removal from the stack. (EPA 2024a)

Mosaic has reported a PG concentration that is consistent with central Florida ores, and which will be confirmed prior to the construction of the pilot project. Consistent with the regulation, EPA has conditioned its approval on receipt of radium-226 sampling that conforms to §61.207 prior to construction of the pilot project: "Sampling that conforms with §61.207 must be performed on the actual phosphogypsum used for the project prior to its removal from the stack. The results of sampling for radium-226, including raw analytical data, must be submitted to the EPA prior to the construction of test road base containing phosphogypsum." (EPA 2024b)
Selecting bounding values to address uncertainty within a risk assessment is common and accepted practice, and consistent with previous risk assessments:

"For these risk assessment scenarios, dose rates and risk may be scaled linearly based on the concentration of Ra-226 in the phosphogypsum used. The TFI risk assessment was based on an activity of 1 Bq/g (27 pCi/g), and Mosaic carried that assumption forward into its current request. EPA based its 2020 analyses on a Ra-226 concentration of 1.3 Bq/g (35 pCi/g), to be certain that the generic risk assessments would be inclusive of all domestic sources of phosphogypsum. In this document, the EPA also scaled each risk calculation to the higher concentration (i.e., 1.3 Bq/g) as the basis for the detailed discussion of each scenario. Mosaic's submission reports that the mean concentration of Ra-226 in samples taken from its New Wales stack is .56 Bq/g (15.1 pCi/g) (Mosaic 2022a, Attachment 12), which will be confirmed by detailed analyses required by §61.207 should the project be approved. Because the risk assessments assume higher Ra-226 concentrations than the phosphogypsum proposed for use in the small-scale pilot project, the risk assessments contained in this document likely overestimate the actual risks associated with this pilot project." (EPA 2024a)

Issue 10: Criticism of the Mosaic Study Design and Sample Handling
One commenter stated that the study design was not sufficient to comment on, and another stated that the objectives were not sufficiently defined for EPA to evaluate or approve the pilot project. Another commenter stated that unless EPA collects duplicate samples, then environmental sampling performed at the site cannot be considered reliable.

<u>EPA Response:</u>

The standard for this action is whether "the proposed distribution and/or use is at leas[t] as protective of public health, in both the short term and the long term," as disposal in a stack. 40 CFR 61.206(c). Based on the of the risk assessment, the EPA has determined that this pilot project would be at least as protective as disposal in a stack.

In its determination of completeness, the EPA found that Mosaic has sufficiently defined its overall goals for the pilot project, which include environmental study. (EPA 2024a) The stated purpose of the pilot project is that it will establish whether phosphogypsum road construction can meet performance requirements regulated by FDOT: "The purpose of the small-scale pilot is to demonstrate the range of PG road construction designs that meet the Florida Standard Specifications for Road and Bridge construction." (Mosaic 2022a, p. 4) Mosaic's initial environmental sampling and monitoring plans are described in Appendix 10 of its March 2022 request, *Proposed Monitoring Plan*. (Mosaic 2022a, p. 4). *Beneficial Use of Mosaic Phosphogypsum* (Townsend et al. 2024) contains detailed information on initial leachate modeling results and planned groundwater studies that address both radiological and non-radiological parameters and describes methodologies that are generally consistent with EPA's methods.

Environmental studies conducted as part of the pilot project are of interest to EPA because they may lead to more refined understanding of the environmental behavior of phosphogypsum. For this reason, EPA has conditioned its approval on receiving all data generated in the course of the project. This data, however, is not required to demonstrate the environmental safety of the pilot project itself. Documenting the quality of the data, including field and laboratory quality assurance practices commensurate with its intended use, is the responsibility of Mosaic.

Issue 11: Environmental Justice
Multiple commenters expressed concern that any risks from either the pilot project or future road use would be borne by disadvantaged communities.

EPA Response:
The EPA technical review determined that the Mosaic Fertilizer pilot project is at least as protective of public health as placement of phosphogypsum in a stack and that implementation of the pilot project would not expose surrounding residents to levels of ionizing radiation in excess of EPA's risk standards, regardless of their environmental justice status. In keeping with its own internal practices, the EPA performed screening to identify potential environmental justice concerns specific to this pilot project. Polk County, Florida where the Mosaic Fertilizer facility is located, in 2022 had a population of 736,000 people with a median age of 39.8 and a median household income of $60,901. According to census data, the five largest ethnic groups in Polk County, Florida are White (Non-Hispanic) (54.4%), Black or African American (Non-Hispanic) (14.4%), White (Hispanic) (10%), Other (Hispanic) (8.91%), and Two+ (Hispanic) (6.55%). Statistics for the three census tracts closest to the facility (tracts 148.02, 161, and 139.03) were comparable. The nearest resident is located more than three miles from an existing stack on the Mosaic Fertilizer facility, and 2.4 miles from the project site. EPA's public outreach was local, and bilingual. Neither EPA's screening efforts nor any public comment identified an environmental justice issue or community that is specific to this pilot project.

References

40 CFR Part 61 Subpart R. *National Emission Standards for Hazardous Air Pollutants (NESHAP): National Emission Standards for Radon Emissions from Phosphogypsum Stacks*.

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Arcadis 2019. Arcadis Canada Inc. *Radiological Risk Assessment in Support of Petition for Beneficial Use of Phosphogypsum*. Prepared for The Fertilizer Institute. October 2019.

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EPA 2016a. U.S. Environmental Protection Agency. *Methodology for Evaluating Beneficial Uses of Industrial Non-Hazardous Secondary Materials.* EPA 530-R-16-011, April 2016.

EPA 2016b. U.S. Environmental Protection Agency. Beneficial Use Compendium: A Collection of Resources and Tools to Support Beneficial Use Applications. EPA 530-R-16-009, June 2016.

EPA 2020a. U.S. Environmental Protection Agency. Review of the Radiological Risk Assessment In Support of Petition for Beneficial Use of Phosphogypsum Prepared for the Fertilizer Institute. E-Docket EPA-HQ-OAR-2020-0442. October 14, 2020.

EPA 2020b. Letter from Andrew Wheeler to Corey Rosenbusch. October 14, 2020.

EPA 2021. Withdrawal of Approval for Use of Phosphogypsum in Road Construction Federal Register Volume 86, No. 127, July 7, 2021, 35795.

EPA 2023. Letter from Jonathan Walsh to Patrick Kane. March 17, 2023.

EPA 2024a. U.S. Environmental Protection Agency. Review of the Small-scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC. E-Docket EPA-HQ-OAR-2024-0446. October 1, 2024.

EPA 2024b. Letter from Joseph Goffman to Patrick Kane Issuing pending approval of a small-scale pilot road project on Mosaic's property at its New Wales facility in Mulberry, Florida. EPA-HQ-OAR-2024-0446. October 1, 2024.

Mosaic 2024a. *Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project; November 27, 2023, Meeting; Response to Questions*. February 7, 2024.

Mosaic 2024b. Updated map of pilot project.

Mosaic 2023. *Revised Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project*. Letter from Pat Kane to Jonathan Walsh, August 23, 2023.

Mosaic 2022b. *Response to EPA September 9, 2022 Request for Information; Small-scale Pilot Project.* December 22, 2022.

Mosaic 2022a. *Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R § 61.206, Small-scale Road Pilot Project on Private Land in Florida,* March 31, 2022.

SC&A, Inc. 2020. Technical Review of The Fertilizer Institute Risk Assessment for Additional Use of Phosphogypsum in Road Base. Prepared for U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Contract Number EP-D-10-042, Work Assignment No. 6-20.

TFI 2019. The Fertilizer Institute. *Supplement to the October 11, 2019 TFI Phosphogypsum Reuse Petition: 2019 Radium-226 Results for U.S. Phosphogypsum Stacks*. December 5, 2019.

TFI 2020. The Fertilizer Institute. *Revised Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206.* Use in Road Construction projects authorized by federal, state and local Departments of Transportation or Public Works. April 7, 2020.

Townsend, et al. 2024. Townsend, Timothy, Kate Weiksnar, Jordan Magnuson, Malik DeWindt. *Beneficial Use of Mosaic Phosphogypsum.* Prepared for Mosaic Fertilizer, LLC. University of Florida Engineering School of Sustainable Infrastructure and Environment. February 7, 2024.

I. Appendix: Contents of specific comments

Comments are listed below by Docket ID number. All comments are available via E Docket EPA-HQ-OAR-2024-0446, at https://www.regulations.gov/docket/EPA-HQ-OAR-2024-0446/comments

Numbered Issues:
Issue 1: Requests for Extension of the Public Comment Period
Issue 2: General Opposition to the Use of Phosphogypsum in Road Construction
Issue 3: Permissibility of road construction as an "other use"
Issue 4: Concerns under statutes other than the Clean Air Act
Issue 5: Criticism of EPA's risk threshold
Issue 6: Criticism of EPA's risk models and methodology
Issue 7: Criticism of risk assessment scenarios
Issue 8: Model selection
Issue 9: Radium sampling
Issue 10: Criticism of the Mosaic study design and sample handling
Issue 11: Environmental Justice

Docket ID No: EPA-HQ-OAR-2024-0446-0007
Received Oct 10, posted Oct 15, 2024
Elaine Trotter
Issues raised: 2, 11

Docket ID No: EPA-HQ-OAR-2024-0446-0008
Received October 16, posted October 17, 2024
JW Glass, Center for Biological Diversity
Issues raised: 1

Docket ID No: EPA-HQ-OAR-2024-0446-0009
Received Oct 18, posted October 23, 2024
American Indian Movement Florida Chapter
Issues raised: 2, 4

Docket ID No: EPA-HQ-OAR-2024-0446-0010
Received October 21, posted October 23, 2024
Lisa Evans, Earthjustice
Issues raised: 1

Docket ID No: EPA-HQ-OAR-2024-0446-0011
Received Oct 19, posted October 28, 2024
Sierra Club Loxahatchee
Issues raised: 1, 2

Docket ID No: EPA-HQ-OAR-2024-0446-0012
Received Nov 1, posted Nov 4, 2024
U.S. Rep. Maxwell Alejandro Frost
Issues raised: 1

Docket ID No: EPA-HQ-OAR-2024-0446-0013
Received October 23, posted Nov 5, 2024
Cynthia Diane Thorpe
Issues raised: 2

Docket ID No: EPA-HQ-OAR-2024-0446-0014
Received Nov 5, posted Nov 5, 2024
ManaSota-88, Inc.
Issues raised: 1, 2, 11

[Docket ID No: EPA-HQ-OAR-2024-0446-0015 – FR notice granting comment period extension]

Docket ID No: EPA-HQ-OAR-2024-0446-0016
November 13, 2024
Brooks Armstrong, People for Protecting Peace River
Issues raised: 2, 3, 7, 11

Docket ID No: EPA-HQ-OAR-2024-0446-0017
Received Nov 5, posted Nov 13, 2024
Robin Anderson
Issues raised: 2, 3, 6, 7, 10, 11

EPA-HQ-OAR-2024-0446-0018
Received November 7, posted November 13, 2024
Tami Thatcher
Issues raised: 2, 5, 6

EPA-HQ-OAR-2024-0446-0019
Nov 13, 2024
Brooke Gaebe
Issues raised: 2

EPA-HQ-OAR-2024-0446-0020
Nov 14, 2024
Mass comment campaign sponsored by Environmental Action with 11,121 signatories
Issues raised: 2

EPA-HQ-OAR-2024-0446-0021

Nov 14, 2024
Mass comment campaign sponsored by U.S. Public Interest Research Group with 10,549 signatories.
Issues raised: 2

EPA-HQ-OAR-2024-0446-0022
Submitted Nov 15, posted Nov 18, 2024
Barbara Angelucci
Issues raised: 2

EPA-HQ-OAR-2024-0446-0023
Submitted Nov 22, posted Nov 25, 2024
North America's Building Trades Unions
Issues raised: 3, 7, 10

EPA-HQ-OAR-2024-0446-0024
Submitted Nov 22, posted Nov 25, 2024
Surfrider Foundation
Issues raised: 2, 3, 5, 7, 10

EPA-HQ-OAR-2024-0446-0025
Submitted Nov 22, posted Nov 25, 2024
Centers for Biological Diversity et al., signed by 24 environmental organizations
Issues raised: 2, 3, 5, 11

EPA-HQ-OAR-2024-0446-0026
Submitted Nov 22, posted Nov 25, 2024
Office of U.S. Representative Maxwell Frost
Issues raised: 2, 4, 6, 7

EPA-HQ-OAR-2024-0446-0027
Submitted Nov 23, posted Nov 25, 2024
Carol Kio-Green
Issues raised: 2

EPA-HQ-OAR-2024-0446-0028
Submitted Nov 23, posted Nov 25, 2024
Center for Biological Diversity
Issues raised: 2, 3, 4, 5, 6, 7, 8 9

EPA-HQ-OAR-2024-0446-0029
Submitted Oct 15, posted Nov 25, 2024
Anonymous
Issues raised: 2

EPA-HQ-OAR-2024-0446-0030
Submitted Oct 18, posted Nov 25, 2024
Austin Tennant
Issues raised: 2

EPA-HQ-OAR-2024-0446-0031
Submitted Oct 15, posted Nov 25, 2024
Austin Tennant
Issues raised: 2

EPA-HQ-OAR-2024-0446-0032
Submitted Oct 18, posted Nov 25, 2024
David Savage
Issues raised: 2

EPA-HQ-OAR-2024-0446-0033
Submitted Oct 18, posted Nov 25, 2024
Christopher Provett
Issues raised: 2

EPA-HQ-OAR-2024-0446-0034
Submitted Oct 18, posted Nov 25, 2024
Tamy Allen
Issues raised: 2

EPA-HQ-OAR-2024-0446-0035
Submitted Oct 18, posted Nov 25, 2024
William Childers
Issues raised: 2

EPA-HQ-OAR-2024-0446-0036
Submitted Oct 19, posted Nov 25, 2024
Patrick Conroy
Issues raised: 2

EPA-HQ-OAR-2024-0446-0037
Submitted Oct 20, posted Nov 25, 2024
LA Murphy
Issues raised: 2

EPA-HQ-OAR-2024-0446-0038
Submitted Oct 21, posted Nov 25, 2024
Pamela Thompson

Issues raised: 2

EPA-HQ-OAR-2024-0446-0039
Submitted Oct 21, posted Nov 25, 2024
Hunter Sullivan
Issues raised: 2

EPA-HQ-OAR-2024-0446-0040
Submitted Oct 22, posted Nov 25, 2024
Anonymous
Issues raised: 2, 7

EPA-HQ-OAR-2024-0446-0041
Submitted Nov 1, posted Nov 25, 2024
Mary Hampton
Issues raised: 2

EPA-HQ-OAR-2024-0446-0042
Submitted Nov 2, posted Nov 25, 2024
Jane Armstrong
Issues raised: 2

EPA-HQ-OAR-2024-0446-0043
Submitted Nov 3, posted Nov 25, 2024
Robert Cusick
Issues raised: 2

EPA-HQ-OAR-2024-0446-0044
Submitted Nov 3, posted Nov 25, 2024
Ellie Hayes
Issues raised: 2

EPA-HQ-OAR-2024-0446-0045
Submitted Nov 3, posted Nov 25, 2024
Sharin Stone
Issues raised: 2

EPA-HQ-OAR-2024-0446-0046
Submitted Nov 8, posted Nov 25, 2024
Amelia Jones
Issues raised: 2

EPA-HQ-OAR-2024-0446-0047
Submitted Oct 15, posted Nov 25, 2024
Cynthia Thorpe
Issues raised: 2

EPA-HQ-OAR-2024-0446-0048
Submitted Oct 15, posted Nov 25, 2024
Frankl Darden
Issues raised: 2

EPA-HQ-OAR-2024-0446-0049
Submitted Oct 15, posted Nov 25, 2024
Anonymous
Issues raised: 2

EPA-HQ-OAR-2024-0446-0050
Submitted Oct 15, posted Nov 25, 2024
Lise Crossman
Issues raised: 2

EPA-HQ-OAR-2024-0446-0051
Submitted Oct 15, posted Nov 25, 2024
Don Horn
Issues raised: 2

EPA-HQ-OAR-2024-0446-0052
Submitted Oct 15, posted Nov 25, 2024
Amy Arensdorf
Issues raised: 2

EPA-HQ-OAR-2024-0446-0053
Submitted Oct 17, posted Nov 25, 2024
Michelle Jordan
Issues raised: 2

EPA-HQ-OAR-2024-0446-0054
Submitted Oct 17, posted Nov 25, 2024
Lisa Sciacca
Issues raised: 2

EPA-HQ-OAR-2024-0446-0055
Submitted Oct 18, posted Nov 25, 2024
Anonymous

Issues raised: 2

EPA-HQ-OAR-2024-0446-0056
Submitted Oct 18, posted Nov 25, 2024
Jessica Namath
Issues raised: 1, 2

EPA-HQ-OAR-2024-0446-0057
Submitted Oct 18, posted Nov 25, 2024
Mary Ellsworth
Issues raised: 2

EPA-HQ-OAR-2024-0446-0058
Submitted Oct 18, posted Nov 25, 2024
Kristine Timmes
Issues raised: 2

EPA-HQ-OAR-2024-0446-0059
Submitted Oct 18, posted Nov 25, 2024
Jason Ibarra
Issues raised: 2

EPA-HQ-OAR-2024-0446-0060
Submitted Oct 18, posted Nov 25, 2024
Garrett Stuart
Issues raised: 2

EPA-HQ-OAR-2024-0446-0061
Submitted Nov 7, posted Nov 25, 2024
Anonymous
Issues raised: 2

EPA-HQ-OAR-2024-0446-0062
Submitted Nov 7, posted Nov 25, 2024
Glen Gibellina
Issues raised: 2

EPA-HQ-OAR-2024-0446-0063
Submitted Oct 18, posted Nov 25, 2024
Derek Harris
Issues raised: Support for pilot project

EPA-HQ-OAR-2024-0446-0064
Submitted Oct 30, posted Nov 25, 2024
Karen A Wiley
Issues raised: 2

EPA-HQ-OAR-2024-0446-0065
Submitted Oct 30, posted Nov 25, 2024
Anonymous
Issues raised: 2

EPA-HQ-OAR-2024-0446-0066
Submitted Oct 30, posted Nov 25, 2024
Environmental Confederation of Southwest Florida
Issues raised: 2

EPA-HQ-OAR-2024-0446-0067
Submitted Oct 30, posted Nov 25, 2024
Elizabeth King
Issues raised: 2

EPA-HQ-OAR-2024-0446-0068
Submitted Oct 31, posted Nov 25, 2024
Margaret Klimek
Issues raised: 2

EPA-HQ-OAR-2024-0446-0069
Submitted Oct 31, posted Nov 25, 2024
David Morgan
Issues raised: 2

EPA-HQ-OAR-2024-0446-0070
Submitted Oct 31, posted Nov 25, 2024
Anonymous
Issues raised: 2

EPA-HQ-OAR-2024-0446-0071
Submitted Nov 1, posted Nov 25, 2024
Mary Lundeberg
Issues raised: 2

EPA-HQ-OAR-2024-0446-0072
Submitted Nov 6, posted Nov 25, 2024
Caleb Merendino

Issues raised: 2, 3

EPA-HQ-OAR-2024-0446-0073
Submitted Oct 25, posted Nov 26, 2024
Mary Morris
Issues raised: 2, 3

EPA-HQ-OAR-2024-0446-0074
Submitted Oct 25, posted Nov 26, 2024
Cecilia Davis-Taylor
Issues raised: 2

EPA-HQ-OAR-2024-0446-0075
Submitted Oct 25, posted Nov 26, 2024
Daniel Calvo
Issues raised: 2

EPA-HQ-OAR-2024-0446-0076
Submitted Oct 30, posted Nov 26, 2024
Henry Kuhlman
Issues raised: 2

EPA-HQ-OAR-2024-0446-0077
Submitted Oct 24, posted Nov 26, 2024
Peter Bart
Issues raised: 2

EPA-HQ-OAR-2024-0446-0078
Submitted Oct 25, posted Nov 26, 2024
Betty Osceola
Issues raised: 2

EPA-HQ-OAR-2024-0446-0079
Submitted Oct 25, posted Nov 26, 2024
Anonymous
Issues raised: 2

EPA-HQ-OAR-2024-0446-0080
Submitted Oct 25, posted Nov 26, 2024
Terra Butler
Issues raised: 2

EPA-HQ-OAR-2024-0446-0081
Submitted Oct 27, posted Nov 26, 2024
James Blankenship
Issues raised: 2, 7

EPA-HQ-OAR-2024-0446-0082
Submitted Oct 28, posted Nov 26, 2024
Jeanna Scott
Issues raised: 2

EPA-HQ-OAR-2024-0446-0083
Submitted Oct 28, posted Nov 26, 2024
Anonymous
Issues raised: 2

EPA-HQ-OAR-2024-0446-0084
Submitted Oct 29, posted Nov 26, 2024
Susan Renison
Issues raised: 2

EPA-HQ-OAR-2024-0446-0085
Submitted Oct 29, posted Nov 26, 2024
William Gebel
Issues raised: 2, 7

EPA-HQ-OAR-2024-0446-0086
Submitted Nov 3, posted Nov 26, 2024
William (Coty) Keller
Issues raised: 2

EPA-HQ-OAR-2024-0446-0087
Submitted Nov 5, posted Nov 26, 2024
Julie Brown
Issues raised: 2

EPA-HQ-OAR-2024-0446-0088
Submitted Nov 5, posted Nov 26, 2024
Randall Miller
Issues raised: 2

EPA-HQ-OAR-2024-0446-0089
Submitted Nov 5, posted Nov 26, 2024
Felicia Tencza
Issues raised: 2

EPA-HQ-OAR-2024-0446-0090
Submitted Nov 6, posted Nov 26, 2024
Pola Godsey
Issues raised: 2

EPA-HQ-OAR-2024-0446-0091
Submitted Nov 6, posted Nov 26, 2024
Leslie Harris
Issues raised: 2

EPA-HQ-OAR-2024-0446-0092
Submitted Nov 7, posted Nov 26, 2024
Cheryl Jozsa
Issues raised: 2

EPA-HQ-OAR-2024-0446-0093
Submitted Nov 7, posted Nov 26, 2024
Honey Rand
Issues raised: 2

EPA-HQ-OAR-2024-0446-0094
Submitted Nov 7, posted Nov 26, 2024
Christopher Lish
Issues raised: 2, 3

EPA-HQ-OAR-2024-0446-0095
Submitted Nov 7, posted Nov 26, 2024
Sarah Hollenhorst
Issues raised: 2

EPA-HQ-OAR-2024-0446-0096
Submitted Nov 7, posted Nov 26, 2024
Karina Oquendo
Issues raised: 2, 4

EPA-HQ-OAR-2024-0446-0097

Submitted Oct 15, posted Nov 26, 2024
Mary Pryor
Issues raised: 2

EPA-HQ-OAR-2024-0446-0098
Submitted Nov 3, posted Nov 26, 2024
Anonymous mass comment, 346 signatories
Issues raised: 2, 3

EPA-HQ-OAR-2024-0446-0099
Duplicate of EPA-HQ-OAR-2024-0446-0024

Tab 6

ASSISTANT ADMINISTRATOR FOR AIR AND RADIATION
WASHINGTON, D.C. 20460

December 20, 2024

Mr. Patrick Kane
Vice President, EHS Enterprise Operations
Mosaic Fertilizer, LLC
13830 Circa Crossing Drive
Lithia, Florida 33547

Dear Mr. Kane:

Mosaic Fertilizer, LLC (Mosaic) has asked the U.S. Environmental Protection Agency to approve, under 40 CFR 61.206, the use of phosphogypsum in a small-scale pilot road project on Mosaic's property at its New Wales facility in Mulberry, Florida. This letter serves as official notice of approval of your request, subject to the terms and conditions described below.

The EPA's approval of this request was based on the following findings:

- Mosaic's request is complete per the requirements of 40 CFR 61.206(b).
- Mosaic's risk assessment is technically acceptable and indicates that the potential radiological risks from the proposed project meet the regulatory requirements of 40 CFR 61.206(c); that is, the project poses no greater radiological risk than maintaining the phosphogypsum in a stack.

Consistent with the process described in Section 2.4 of the 2005 guidance document "Applying to EPA for Approval of Other Uses of Phosphogypsum: Preparing and Submitting a Complete Petition Under 40 CFR 61.206, A Workbook," the EPA published a notice of pending approval in the Federal Register on October 9, 2024, and opened a 30-day public comment period, which was extended to November 23, 2024. The EPA has reviewed the comments received, and found that none contain new information which would call into question the technical basis of the risk assessment for this pilot project. Complete documentation of the EPA's review, including public comments and the agency's response to comments, may be found in e-Docket EPA-HQ-OAR-2024-0446, accessible at https://www.regulations.gov/docket/EPA-HQ-OAR-2024-0446.

The EPA's approval of this small-scale pilot project is contingent upon the following conditions:

1. The approval is valid only for the construction of the specific pilot project as described by the applicant, specifically:

- Phosphogypsum for the pilot project will be taken from the New Wales South stack.
- Four sections of test road containing phosphogypsum in the road base, each 500 feet long and 24 feet wide, will be constructed in place of the existing road adjacent to the New Wales stacks. Four control sections of road not containing phosphogypsum will also be constructed, each 300 feet long and 24 feet wide.
- Test road sections will contain no more than 50% phosphogypsum by weight in a single 10-inch layer of road base.
- Phosphogypsum will not be included in pavement, nor extend beyond paved areas of the road.
- No changes may be made to the design of the pilot project without the EPA's approval.

2. Mosaic shall perform sampling that conforms with §61.207 on the actual phosphogypsum used for the project prior to its removal from the stack. Mosaic must submit the results of sampling for radium-226, including raw analytical data, to the EPA prior to the construction of the test road base containing phosphogypsum.

3. Mosaic must provide a written project schedule to the EPA at least 30 days prior to beginning construction of the test road base, so that the EPA may, at its option, observe construction of the pilot project. Mosaic shall provide written project status updates to the EPA every 90 days after submittal of the initial project schedule, until submittal of the final report in fulfillment of condition 8.

4. Mosaic must return any phosphogypsum that is unused in the road construction to the stack upon completion of the pilot project construction. Mosaic must likewise return to the stack any phosphogypsum that is removed as part of road maintenance and not reincorporated into the road base.

5. Mosaic shall inform all workers involved in the test road construction that phosphogypsum contains elevated levels of naturally occurring radionuclides and instruct them in proper industrial hygiene prior to working on the project.

6. Mosaic shall meet all of the applicable requirements of 40 CFR 61.200-210. This approval does not supersede the requirements of any other Federal or State regulation.

7. Mosaic shall complete all environmental sampling as described in the document *Beneficial Use of Mosaic Phosphogypsum,* for a minimum of 18 months. Mosaic shall submit all sampling results, including reports and raw analytical data, to the EPA no more than 60 days after they are generated.

8. Within 90 days of completing the test phase, Mosaic shall submit to the EPA and to the Florida Department of Environmental Protection a complete final report on the test, including conclusions on the suitability of phosphogypsum as a component of road base.

This approval is pursuant to 40 CFR Part 61, Subpart R, promulgated under the authority of the Clean Air Act. This approval does not relieve Mosaic from responsibility to comply with all other federal, state, or local laws, regulations, or restrictions on the use of phosphogypsum. Any use of phosphogypsum not consistent with the limitations set forth in this approval shall be construed as unauthorized distribution of phosphogypsum and may constitute a violation of or noncompliance with 40 CFR Part 61, Subpart R. Approval by the EPA is specific to the pilot project as described in the Mosaic request. Any other instance of use of phosphogypsum requires a separate request and approval.

Please contact Jonathan Walsh at 202-342-9238 or walsh.jonathan@epa.gov for any further assistance.

Sincerely,

Joseph Goffman
Assistant Administrator

cc: Karen Bennett, Earth and Water Law
Jonathan Edwards, EPA
Lee Veal, EPA
Tom Peake, EPA
Jonathan Walsh, EPA
John Coates, Florida DEP

Tab 7

CENTER for BIOLOGICAL DIVERSITY Because life is good.

November 23, 2024

Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1200 Pennsylvania Ave. NW
Washington, DC 20460

Re: Pending Approval for Other Use of Phosphogypsum (EPA-HQ-OAR-2024-0446)

The Center for Biological Diversity ("Center") provides the following comments in response to Environmental Protection Agency's ("EPA") pending approval of The Mosaic Company's ("Mosaic") request to use phosphogypsum from its New Wales facility in road construction.

I. Introduction

EPA's approval violates the Clean Air Act ("CAA"), Administrative Procedures Act ("APA") and the Resource Conservation and Recovery Act ("RCRA"), and if EPA finalizes this unlawful action, it will undoubtably be used to justify approval of phosphogypsum in road construction nationwide as a false solution to the environmentally destructive phosphogypsum stacks across the country.

Since 1992, EPA has barred the use of phosphogypsum in roads citing an "unacceptable level of risk to public health."[1] At the same time EPA affirmatively denied the application of phosphogypsum in road construction, it promulgated a specific subsection where it would consider approving uses of phosphogypsum for "other purposes" on a case-by-case basis, so long as the proposed use is "at least as protective, in both the short and long term, as placement in a stack."[2] EPA found the "maximum individual risk of fatal cancer from radon from phosphogypsum stacks is 9 in 100,000 or 9 x 10^{-5}" meaning any approval for "other purposes" must meet that threshold.[3]

Even if EPA were to view Mosaic's application as an "other purpose," this application is incomplete, arbitrarily limited, and significantly deviates from EPA's risk assessment. The application improperly incorporated The Fertilizer Institute's ("TFI") 2019 application that EPA withdrew approval of in 2021, seeking back-end approval of a fundamentally flawed risk assessment that triples the acceptable cancer risk, ignores significant pathways of exposure, erases the concept of maximum individual risk, and only considers abbreviated timeframes in its lifetime cancer risk assessments.

[1] National Emission Standards for Hazardous Air Pollutants; National Emissions Standards for Radon Emissions from Phosphogypsum Stacks, 57 Fed. Reg. 23305, 23311-12. (June 3, 1992) ("1992 Rule").
[2] 40 § C.F.R. 61.207.
[3] 57 Fed. Reg. at 23306.

The application is correct in asserting that phosphogypsum stacks "are creating environmental, land use and viewshed concerns," including the historically unstable New Wales facility where this project will occur, but incorrect in implying that EPA's approval will lead to any substantial reduction in stacks.[4] Even in an extremely comprehensive scheme of phosphogypsum removal for alternative uses, utilization would never catch up with current output. As of 2020, China has attempted full-scale utilization of phosphogypsum without regard for human health and the environment but found that its annual production of 75 million tons per year was not out paced by the 31 million tons of utilized.[5] Even if EPA adopts the same mentality and disregards its mission to protect human health and the environment, utilization will not displace the 1.7 billion tons in stacks and 46 million tons produced each year in the United States.[6]

II. Regulatory History

Phosphogypsum is the radioactive, carcinogenic, toxic waste generated by the fertilizer industry when it makes phosphoric acid for use in phosphate-based fertilizers.[7] This process also generates radioactive process wastewater, which contains numerous toxic constituents and is corrosive due to its acidity.[8] Despite these dangers, EPA exempted phosphogypsum and process wastewater from hazardous waste regulations under what is known as the "Bevill Determination."[9] These wastes are discarded together in "gypstacks"[10], often over one square mile wide and hundreds of feet tall. Each of these facilities, including the proposed site of this project, are prone to groundwater contamination, leakage, and sinkholes.

In its Bevill Determination, EPA explicitly identified phosphogypsum and process wastewater as having remaining risks that EPA intended to address.[11] Therefore, instead of implementing hazardous waste regulation under Subtitle C of the Resource Conservation and Recovery Act ("RCRA"), EPA announced its intent to develop and promulgate a regulatory program under Toxic Substances and Control Act ("TSCA") to govern phosphoric acid production processes and reduce phosphogypsum and process wastewater toxicity and volume at the point of generation.[12] EPA's intent to improve phosphogypsum and process wastewater regulation never came to fruition. As noted above, the industry is now generating more than 46 million tons of

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[4] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 19 (March 31, 2022).
[5] Economic Daily, Is the "slag mountain" by the Yangtze River solid waste or unpolished jade? Investigation on the pollution and comprehensive utilization of phosphogypsum storage (Dec 2020), http://www.xinhuanet.com/politics/2020-12/21/c_1126885088.htm. ("However, facing the stockpile of 600 million tons and the annual production of 75 million tons, the annual use of phosphogypsum is currently only 31 million tons. The speed of comprehensive utilization still cannot catch up with the output.").
[6] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 19 (March 31, 2022); FIPR Institute, Phosphogypsum Stacks, https://fipr.floridapoly.edu/about-us/phosphate-primer/phosphogypsum-stacks.php.
[7] *See* EPA, Background Information Document, Potential Uses of Phosphogypsum and Associated Risks, at 2-1 – 2-2, 2-6, 2-8 (May, 1992).
[8] EPA, Report to Congress on Special Wastes from Mineral Processing, at 12-7, 12-8 (July, 1990).
[9] Final Regulatory Determination for Special Wastes From Mineral Processing (Mining Waste Exclusion), 56 Fed. Reg. 27300 (June 13, 1991) (Bevill Determination).
[10] 40 § C.F.R. 61.202.
[11] 56 Fed. Reg. at 27316.
[12] *Id.*

phosphogypsum every year, and 1.7 billion tons of this waste are stored in ever-expanding gypstacks across the country.[13]

III. EPA Has Already Determined This Use Presents an Unreasonable Risk of Harm and is, Therefore, Not the Type of "Other Purpose" Contemplated by Regulation.

EPA has already considered this alternative use and summarily rejected it in a previous rulemaking. EPA promulgated National Emission Standards for Hazardous Air Pollutants ("NESHAPs") for radon emissions from phosphogypsum stacks and subsequently reviewed a petition for reconsideration where it approved agricultural and research use but rejected use in road construction.[14] Mosaic's application is not properly a request for an "other purpose" of phosphogypsum within the meaning of 40 C.F.R. 61 Subpart R because EPA already determined road use presented an unreasonable risk to public health.[15] EPA's 1992 rule outlined the process for EPA to consider "other" uses of phosphogypsum for approval, which includes an EPA determination that the proposed distribution or use of the phosphogypsum is at least as protective of the public health, on both the short term and the long term, as is disposal of phosphogypsum in a stack or a mine.[16]

To the extent EPA would like to characterize Mosaic's petition as a request for an "other purpose," EPA relies on an absurd interpretation of "other" under 40 C.F.R. § 61.206(c) given that EPA's 1992 rule explicitly analyzed and rejected the use of PG in road construction. EPA's interpretation would define "other" established in the 1992 rule to mean "other than agricultural and research uses," rather than "other than the uses considered and approved or rejected in the 1992 rule."[17] But this explanation seeks to rewrite EPA's well-documented rulemaking from 1992, which shows that EPA evaluated the use of phosphogypsum in road construction, and after notice and comment and a petition to reconsider from The Fertilizer Institute ("TFI"), determined not to authorize that purpose.[18]

At best, Mosaic's application serves as untimely petition for reconsideration of the 1992 rule, which TFI unsuccessfully tried. The CAA allows parties to petition EPA for reconsideration of a rule "if it was impracticable to raise such objection within such time or if the grounds for such objection arose after the period for public comment (but within the time specified for judicial review)."[19] The 1992 rule states that under § 7607(b)(1) "judicial review of decision under section 112 is available only by filing a petition for review in the United States Court of Appeals for the District of Columbia Circuit within 60 days of" the publication of the rule,[20] meaning that the time specified for judicial review was 60 days, and therefore, an objection must have been raised in that 60 days. Viewing Mosaic's request to allow phosphogypsum in purposes EPA

[13] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 19 (March 31, 2022); FIPR Institute, Phosphogypsum Stacks, https://fipr.floridapoly.edu/about-us/phosphate-primer/phosphogypsum-stacks.php.
[14] 57 Fed. Reg. at 23305, 23311.
[15] *Id.* at 23311-12.
[16] *Id.* at 23305.
[17] *Id.*; 40 C.F.R. § 61.206.
[18] 57 Fed. Reg. at 23305, 23311-12.
[19] 42 U.S.C. § 7607(d)(7)(B).
[20] 57 Fed. Reg. at 23305.

rejected in 1992 as a petition for reconsideration, it is untimely, and EPA should have denied it for falling more than 30 years outside of the Clean Air Act's 60-day deadline for judicial review provided by §7607(b)(1).

IV. EPA's Arbitrary Assessment of Cancer Risk Violates the Clean Air Act and Administrative Procedures Act.

EPA's pending approval utilizes an unlawfully inflated risk factor, authorizes an exposure metric not utilized in CAA analyses, ignores significant pathways of exposure present in every analysis predating this application, accepts unverifiable phosphogypsum sampling data, and changes risk assessment models without explanation. If EPA approves this project through an application without rulemaking, it will erase the long-standing concept of maximum individual risk, allow for small-scale projects meant to validate further use to ignore exposure pathways, approve unvalidated and outdated sampling to underline approvals, and replace long-standing regulatory timeframes with abbreviated intervals in lifetime cancer risk assessments.

EPA's approval of an application with such flaws is inherently arbitrary, but the fact that EPA is also considering approving a cancer risk threshold three times than what it has historically allowed contradicts the Administration's goals to "end cancer as we know it today" through its Cancer Moonshot.[21]

a. EPA applies the incorrect legal risk factor for its risk assessment and erroneously accepts that 3 in 10,000 is the proper risk threshold.

The D.C. Circuit in *Vinyl Chloride* set out a two-step decision process for EPA to follow in setting NESHAPs under CAA § 112: (1) determine a "safe" or "acceptable" health risk level; and (2) set the standard at the level – which may be lower but not higher than the "safe" or acceptable" level – that protects public health with an ample margin of safety.[22] The D.C. Circuit held EPA "cannot consider cost and technological feasibility in determining what is 'safe.' This determination must be based solely upon the risk to health."[23]

EPA, based on an analysis of certain benzene sources, established a presumption of acceptability for a risk posed by a hazardous air pollutant analyzed under CAA § 112 of 1 in 10,000 to the maximally exposed individual and a goal to protect the greatest number of persons possible to a lifetime risk level no higher than approximately 1 in 1,000,000.[24] EPA was then to consider "other information, including economic costs and technical feasibility, along with all of the health-related factors previously used to determine the 'safe' level, to set a standard which protects public health with an ample margin of safety."[25] Like vinyl chloride and benzene, radon

[21] U.S. White House Briefing Room, Fact Sheet: President Biden Reignites Cancer Moonshot to End Cancer as We Know It (Feb. 2, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/02/fact-sheet-president-biden-reignites-cancer-moonshot-to-end-cancer-as-we-know-it/.
[22] 57 Fed. Reg. at 23306.
[23] *NRDC v. EPA*, 824 F.2d 1146, 1166 (D.C. Cir. 1987).
[24] National Emission Standards for Hazardous Air Pollutants; Benzene Emissions From Maleic Anhydride Plants, Ethylbenzene/Styrene Plants, Benzene Storage Vessels, Benzene Equipment Leaks, and Coke By- Product Recovery Plants, 54 Fed. Reg. 38044, 38044-45 (Sept. 14, 1989); 57 Fed. Reg. at 23306.
[25] 57 Fed. Reg. at 23306.

is "an apparent non-threshold pollutant" meaning that "it appears to create a risk to health at all non-zero levels of emissions."[26]

EPA established in 1989 and reiterated in 1992 that the maximum individual risk of fatal cancer from radon from phosphogypsum stacks is 9 in 100,000 or 9 x 10^{-5}.[27] However, this application bases its risk analysis on a threshold of 3 in 10,000, which is more than three times higher (or less protective) than the standard EPA established as the risk to the public from placement in stack systems.

In its review of the application, EPA misinterprets its own regulations. The agency did not, as it claims, "further define[] this benchmark as causing an additional lifetime risk of fatal cancer no greater than 3×10^{-4} (3 in 10,000, or .03%)" in 1992.[28] Instead, EPA specifically determined that there are "certain uses" – namely agricultural amendments and research and development – that EPA will consider acceptable so long as they are "restricted to limit the estimated lifetime risk to any individual to no more than 3 in 10 thousand." EPA explained the "limitations on the amount of phosphogypsum applied, the radium-266 concentration, or both these factors could reduce the risk . . . to acceptable levels" but that "in contrast, regardless of the radium concentration in phosphogypsum, the use of phosphogypsum in road construction *always* resulted in an MIR significantly greater than the presumptive safe level."[29] To that end, phosphogypsum use in both agriculture and research received separate sections in Subpart R with specific limitations designed to reduce risk while road construction was summarily rejected by EPA. Neither section includes reference to the standard that any distribution must be at least protective, in the short and long term, as placement in a stack.[30] EPA's approval for "other purpose," in contrast, still requires that any new distribution meet this standard, which is defined as 9.1 in 100,000.[31]

EPA's decision to promulgate specific rules for agriculture and research in sections 61.205 and 61.206 respectively is not a complete re-tooling of the 1 in 10,000 presumptively safe threshold used in Step 1 of the Vinyl Chloride analysis as it relates to phosphogypsum. EPA decided against including a separate section for road construction and deemed "that the use of phosphogypsum in road construction presents an unacceptable level of risk to public health."[32] If EPA were to reauthorize use of phosphogypsum in road construction, it cannot do so by recategorizing this practice as an "other purpose" and seek approval under an arbitrary risk threshold that not equivalent to the protective standard under Subpart R section 61.206. EPA certainly cannot change the risk threshold through adoption of the 2005 guidance document entitled *Applying to EPA for Approval of Other Uses of Phosphogypsum* ("Workbook" or "2005 Workbook") that was never subject to notice and comment. This guidance document is used as the primary justification to make the regulatory change to a risk threshold of 3 in 10,000 and is

[26] *Id.* at 23311-12.
[27] *Id.* at 23306; 54 Fed. Reg. at 51675.
[28] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 2 (Oct. 1, 2024).
[29] 57 Fed. Reg. at 23311 (emphasis added).
[30] 40 C.F.R. § 61.204-5.
[31] 40 C.F.R. § 61.206.
[32] 57 Fed. Reg. at 23312.

notably the only equivocation of this threshold to the "at least protective, in the short and long term, as placement in a stack" standard.[33]

In 2004, EPA Director of the Office of Radiation and Indoor Air ("ORIA"), Elizabeth Cotsworth clarified that EPA "strive[s] to provide maximum feasible protection against risks to health from hazardous air pollutants, including radionuclides. We do so by trying to limit exposures such that an individual's lifetime excess cancer risk level is really no more than 1 in 10,000."[34] Additionally, in a guidance document that presumably predates the 2005 Workbook, EPA held that "the risk assessment must show that the chance of developing a fatal cancer in people who are exposed to phosphogypsum as a result of the use for which you are applying must not increase more than one in ten thousand (1×10^{-4})"[35]

EPA and Mosaic's continued reliance on the 2005 Workbook, especially as justification for new risk thresholds, is misplaced. This guidance did not undergo notice and comment, but nevertheless purports to change EPA standards promulgated from rulemaking in violation of the APA, CAA and framework from *Vinyl Chloride*. EPA notes that no other use of phosphogypsum has been approved under section 61.206, meaning that this approval would be the first time the 2005 Workbook's improper risk threshold has been used in decision-making.[36] Injury is thus suffered upon approval under the 2005 Workbook, not when the 2005 Workbook was presumably finalized.[37]

For any "other use" of phosphogypsum in Subpart R, the distribution must be as protective as placement in a stack.[38] EPA found that the "estimated maximum individual lifetime risk of fatal cancer from radon emissions from phosphogypsum stacks is 9×10^{-5}."[39] EPA has never made any affirmative determination in rulemaking to the contrary, although it has affirmatively deemed phosphogypsum use in road construction as presenting an unacceptable risk to human health. In 2019 TFI found that several pathways of exposure surpass this threshold, with both road construction workers and truck drivers experiencing a lifetime risk 2×10^{-4}.[40] As noted above, approval on an "other use" based on a risk factor of 3×10^{-4} would violate both the APA and EPA's own regulations under the Clean Air Act.

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[33] U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 5 (Dec. 2005).
[34] House Hearing, 108 Congress, Phosphogypsum: Should We Just Let it All Go To Waste? Parts 1 AND 2, at 1-70 (March 15, 2004).
[35] U.S. EPA, Some Guidance on Applying for Approval for Other Uses of Phosphogypsum (undated), *available at*: https://www.epa.gov/sites/default/files/2015-05/documents/guidance.pdf.
[36] See U.S. EPA, Phosphogypsum, *available at*: https://www.epa.gov/radiation/phosphogypsum ("To date, EPA has not issued a final approval of any applications for other uses of phosphogypsum.").
[37] *See Corner Post, Inc. v. Board of Governors of the Federal Reserve System*, 603 U.S. ___, 6 (2024) ("An APA plaintiff does not have a complete and present cause of action until she suffers an injury.").
[38] 57 Fed. Reg. at 23316.
[39] *Id.* at 23306.
[40] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at A-1 (Oct. 1, 2024).

b. EPA accepts a "reasonable maximum exposure" standard that arbitrarily underestimates risks and has no basis under the Clean Air Act.

Contrary to Mosaic's assertions, EPA does **not** use "a reasonable maximum exposure" metric to assess exposure risk" in the Clean Air Act context.[41] In fact, to our knowledge, EPA's approval of this pilot would be the first time that the agency has authorized a reasonability threshold in its ultimate assessment of "maximum individual risk" as required by regulation. As explained below, this threshold has no basis under the Clean Air Act and critically underestimates risk to the public.

Reasonable maximum exposure ("RME") is a term used in the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") context to describe exposure at abandoned hazardous waste sites. RME has been used by EPA as "the highest exposure reasonably expected to occur *at a Superfund* site and intended to estimate a conservative exposure case."[42] An analyst assessing RME is able to modify underlying assumptions such as the frequency of exposure or the number of years exposed to contamination, although typically this analysis accounts for 30 years of exposure.[43] Unlike the Clean Air Act's purpose to protect and enhance the quality of our nation's air resources, "CERCLA is a remedial statute" aimed at addressing sites that are already heavily polluted and abandoned but that still present a threat to human health and the environment.[44] Former ORIA Director Elizabeth Cotsworth testified before Congress and explaining that "the difference is largely a cleanup, a remedial situation dealing with contaminants that already exist in the environment as opposed to" rulemakings "which are intended to be protective and preventative in nature."[45]

As such, RME is an assessment exposure is apt to assess situations where EPA cannot prevent the existence of a site already designated as a Superfund. And while phosphogypsum stacks are commonly designated as Superfund sites and present substantial risk to human health and the environment,[46] the stack in question is an operating, expanding facility, and the action in question does not involve remediation, but increasing the footprint of where this radioactive waste may be placed.

RME is thus inappropriate in Clean Air Act assessments, particularly this application of a hazardous air pollutant. In fact, RME does not appear in the 1989 Benzene Framework, the 1992 NESHAP, the 2005 Workbook, or Section 61.206 of Subpart R. These rulemakings all refer to

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[41] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 12 (March 31, 2022).
[42] U.S. EPA, Guidelines for Human Health Exposure Assessment, at 63 (Oct. 2019) (emphasis added), https://www.epa.gov/sites/default/files/2020-01/documents/guidelines_for_human_exposure_assessment_final2019.pdf.
[43] James T. Hamilton, W. Kip Viscusi, The Benefits and Costs of Regulatory Reforms for Superfund, 16 Stan. Envtl. L.J. 159, 168 (1997).
[44] 40 U.S.C. §7401 (b)(1); *East Bay Mun. Util. Dist. v. United States DOC*, 948 F. Supp. 78 (D.C. Cir. 1996)
[45] House Hearing, 108 Congress, Phosphogypsum: Should We Just Let it All Go To Waste? Parts 1 AND 2, 1-70 (March 15, 2004).
[46] For example, DOI has recognized that "past and present operations" at J.R. Simplot's Don Plant near Pocatello, Idaho "ha[s] contributed to the cumulative degradation and contamination of surface soils, vegetation, and water resources within the Off-Plant Operable Unite of the EMF Superfund Site." U.S. Department of the Interior, Blackrock Land Exchange Final Environmental Impact Statement, at 3-36 (May 2020).

the concept of "maximum individual risk" ("MIR") as the correct metric in considering estimated risk of contracting cancer. MIR, in contrast to RME, is an inherently more protective standard, meant to prevent cancer risks to the maximum extent possible in accordance with the Clean Air Act.

EPA defined MIR in the 1992 NESHAP for radon as "the maximum additional cancer risk imposed on a person due to exposure to a pollutant for a 70-year lifetime."[47] In its Benzene Framework, EPA expounded on its decision to assess risk over a 70-year period as "preferrable," noting "the 70-year exposure duration represents a steady-state emissions assumption that is consistent with the way in which the measure of carcinogenic strength is expressed."[48]

MIR is inherently not a calculation that should be couched in the likelihood of occurrence as claimed in the application's risk assessment, serving instead as "an estimate of the upperbound of risk based on conservative assumptions," which "does not necessarily reflect the true risk but displays a conservative risk level which - is an upper bound that is unlikely to be exceeded."[49]

In 2004, Director of ORIA Elizabeth Cotsworth again confirmed timeframe, stating that "in terms of most of our regulatory decisions, including those under the Clean Air Act, we do use a 70-year timeframe."[50] Furthermore, Subpart R itself requires EPA to ensure any other use is protective of public health "in both the short term and the long term," which necessarily requires EPA to look at long-term, maximum exposure over a lifetime instead of an arbitrary number of years. Thus, any assessment of an approval of other use must look at a 70-year timeframe in order to assess MIR.

It would thus be arbitrary and violate the Clean Air Act to approve an application that relies upon RME as its justification for limiting its analysis of worker and resident exposure to timeframes shorter than the agency's previously established practice. For example, for this project, road construction workers are assessed for only 5 years and utility workers for only 1 year, where 26 years is consistent with prior EPA assessments for occupational workers. Instead, Mosaic uses this 26-year timeframe only for its assessment of nearest resident, which is years shorter than the 30-year assumption for residential exposure even used in other RME assessments, and decades shorter than 70-year timeframe EPA requires under its Clean Air Act risk assessments.

EPA is familiar with alternative risk assessment principles, including those suggested by the International Commission on Radiological Protections, which are cited in this application. However, the agency specifically rejected these suggestions in response to TFI's petition for reconsideration of the 1992 NESHAP, noting again that:

> EPA's NESHAPs, such as Subpart R, are based on the exposure to the maximally exposed individual, in conformance with the provisions of the Vinyl Chloride decision using the framework of the Benzene NESHAP. In doing this, the EPA

[47] 57 Fed. Reg. at 23305.
[48] 54 Fed. Reg. at 38065.
[49] *Id.* at 38045.
[50] House Hearing, 108 Congress, Phosphogypsum: Should We Just Let it All Go To Waste? Parts 1 AND 2, 1-70 (March 15, 2004).

> ensures that the NESHAPs protect the health **of even the most exposed individual** regardless of the likelihood of that individual's becoming exposed.[51]

EPA's pending approval unlawfully contradicts its long-held interpretation of the Clean Air Act without any reasoned explanation or justification. Even evaluating 30 years of exposure is not the same as evaluating a lifetime risk, and EPA's assertion to the contrary cuts against the Clean Air Act.[52] If EPA approves this application, it will have re-written its own rules without any rational justification or lawful rulemaking procedure, in violation of the Clean Air Act and Administrative Procedures Act.

c. EPA cannot accept the application's unverifiable phosphogypsum sampling data, nor can it authorize a lower assumed average concentration of pCi/g than previously analyzed.

EPA's 2005 Workbook references subsection 61.205(b)(6), wherein the applicant must specify in its application "the average concentration of radium-226 in the phosphogypsum to be used," and where the sampling "must have been done within the past 12 months according to the procedures in 40 C.F.R. § 61.207."[53] Additionally, a copy of 40 C.F.R. § 61.208 certification must be included with the petition.[54]

Mosaic has not provided EPA with the required data on radium-226 concentrations in phosphogypsum to be used in this project. Appendix 12 contains only a single, unverifiable table with samples taken over a single month in 2019. Mosaic failed to provide a certification was included as part of the applications, and only 10 samples – a third of what EPA requires – were taken at unknown intervals. This assessment is now over 4 years old and no longer comports with approval under the 2005 Workbook.[55] Even if the 2005 Workbook does not control, EPA cannot engage in reasoned decision-making by relying on outdated or inaccurate data without any justification.[56]

Even if these samples were current, and even assuming that the single table in Appendix 12 incorporated the assessment of radioactivity included as part of TFI's 2019 application, the sampling would still not comply with EPA's approval process. The TFI supplemental application sampling was done using EPA EML HASL-300 Method Ga-01-R (a 21-day method), entitled "Gamma Radioassay."[57] However, Subpart R 61.207, which EPA cites as the standard that pre-approval sampling must comport with, specifically requires that radiological testing follow

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[51] U.S. EPA, Comments and Response to Comments: NESHAPS, National Emission Standards for Radon Emissions from Phosphogypsum Stacks, at 8 (November 1998).
[52] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 19 (Oct. 1, 2024).
[53] U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 5 (Dec. 2005).
[54] *Id*.
[55] *See* TFI, Supplement to The October 11, 2019 TFI Phosphogypsum Reuse Petition: 2019 Radium-226 Results for U.S. Phosphogypsum Stacks (Dec. 5, 2019).
[56] *Defs. of Wildlife v. United States DOI*, 931 F.3d 339, 351-352 (2019) (internal citations omitted).
[57] TFI, Supplement to The October 11, 2019 TFI Phosphogypsum Reuse Petition: 2019 Radium-226 Results for U.S. Phosphogypsum Stacks, at 1 (Dec. 5, 2019).

Method 114.[58] Method 114 is cited in both EPA's regulation and as a "Category A" test method under EPA's Air Emission Measurement Center.[59] Method Ga-01 is not present on either of these lists, but it appears from the 2019 supplement that "at EPA's request" a TFI member that owns the gypstack in question utilized this methodology instead of what was prescribed by regulation.[60]

Where data is either "outdated or inaccurate" EPA must "at the very least, explain why it nonetheless relied on the data it did."[61] And where an agency "relied upon a submission containing 'no explanation of underlying support' and did not "ascertain[] the accuracy of the data contained in the study," the agency does "not engage in reasoned decision-making."[62] Historically, EPA has engaged in years-long assessments of phosphogypsum in support of its rulemakings, producing a rigorous 200 page analysis that eclipses the single table is provided in the application.[63] EPA has not offered an explanation as to why it is accepting outdated sampling data in contravention of its own historical practice and guidance. Without this explanation, approval based on these data would be arbitrary and capricious.

For all these reasons, the sampling data cannot then justify a risk assessment premised on an assumption that the radioactivity of the phosphogypsum proposed for use in the pilot project measures no more than 27 pCi/g. The TFI risk assessment was based on 27 pCi/g, an assumption that Mosaic carried forward into its current request.[64] This is below the 35 pCi/g that EPA based its 2020 and 1992 analyses on and far below what EPA itself has surveyed in Central Florida. Extensive radiological surveys of phosphogypsum in Central Florida by EPA found concentrations of phosphogypsum ranging from 15.8 pCi/g to 81.1 pCi/g, which it summarized and included as part of its 1992 decision to prohibit use of phosphogypsum in road construction.[65]

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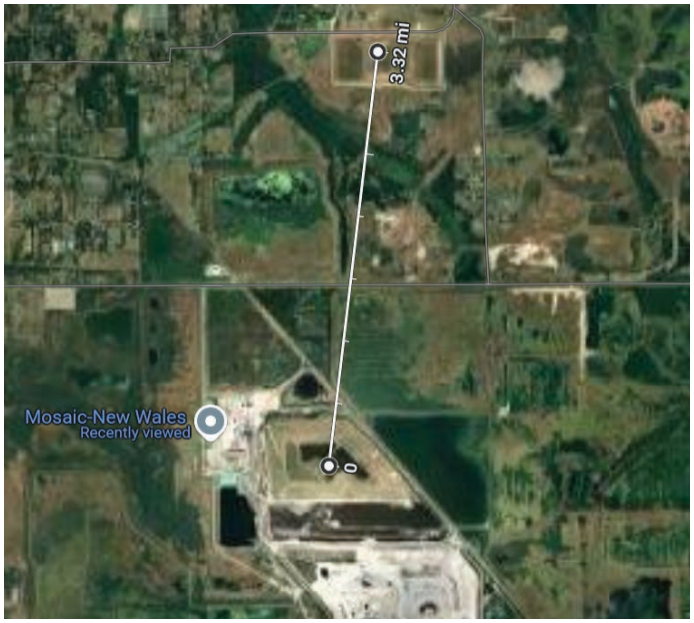
[58] 40 C.F.R. § 61.207(a)(2).
[59] U.S. EPA Air Emission Measurement Center, EMC Test Methods, https://www.epa.gov/emc/emc-test-methods.
[60] TFI, Supplement to The October 11, 2019 TFI Phosphogypsum Reuse Petition: 2019 Radium-226 Results for U.S. Phosphogypsum Stacks, at 1 (Dec. 5, 2019).
[61] *Defs. of Wildlife v. United States DOI*, 931 F.3d at 351-352 (internal citations omitted).
[62] *Inteliquent, Inc. v. FCC*, 35 F.4th 797, 805 (D.C. Cir. 2022) (quoting *New Orleans v. SEC*, 969 F.2d 1163, 1167 (D.C. Cir. 1992)).
[63] *See* U.S. EPA, A Long-Term Study of Radon and Airborne Particulates at Phosphogypsum Stacks in Central Florida (Oct. 1988).
[64] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 16 (Oct. 1, 2024).
[65] U.S. EPA, A Long-Term Study of Radon and Airborne Particulates at Phosphogypsum Stacks in Central Florida, at 78 (Oct. 1988); U.S. EPA, Potential Uses of Phosphogypsum And Associated Risks, Background Information Document, at 2-7 (May 1992).

Table 2-4. Radium-226 concentrations in Florida phosphogypsum samples (Ho88).

Phosphogypsum Stack	Mean Concentration (pCi/g dry)[a]	Concentration Range (pCi/g dry)
Gardinier	33±2	31-37
W.R. Grace	30±9	19-48
Royster	30±11	16-49
Conserv	34±18	23-81
Estech	25±4	19-31

(a). Mean concentration with the standard deviation of samples from 10 locations on each stack.

At the closed Conserv stack, located just three miles from New Wales, EPA found levels of radioactivity four times than what is assumes in its pending approval.[66] This discrepancy is significant.



Moreover, EPA has never accepted a risk assessment premised on 27 pCi/g. EPA cannot resolve this discrepancy simply by comparing outputs in Mosaic's *previous* application or assessments, as the applicant is required by Subpart R to provide a full risk analysis and proper testing. Since

[66] U.S. EPA, A Long-Term Study of Radon and Airborne Particulates at Phosphogypsum Stacks in Central Florida, at 33 (Oct. 1988).

Mosaic has not included this information, or any other information required EPA on the average concentration of radium, the application is incomplete and cannot be approved.

d. EPA must not ignore significant pathways of exposure present in every analysis predating this application.

In 1992, EPA evaluated several pathways of exposure to radiation from phosphogypsum through direct gamma, dust inhalation, as well as ingestion and exposure to contaminated well water, groundwater, and surface water.[67] EPA's assessment was meant to "identify the greatest maximum individual lifetime risk of fatal cancer from several exposed groups: members of critical population groups, members of the general public, people living on contaminated land, and workers."[68] As such, EPA original assessment analyzed a "reclaimer" scenario where a person builds a house on a road surface after it has crumbled and been removed.[69] In its 1992 assessment, EPA found that "maximum individual lifetime risk from direct gamma and radon exposure ranged from 7.5×10^{-4} to 9.3×10^{-3}" far beyond what EPA presumes safe.[70]

In 2020, EPA required TFI to evaluate these pathways, including the reclaimer scenario, as part of its approval.[71] At the time, EPA contracted with environmental consultants SC&A to perform an independent, detailed review of the TFI proposal and risk assessment. SC&A identified numerous problems with the TFI analysis and made a series of recommendations for revisions, including the need to use "more realistic (i.e., less optimistic) parameter values or provide additional justification for the values,"[72] which EPA appeared to have ignored, but that are nonetheless critical in evaluating the safety of phosphogypsum use in road construction.

Mosaic's application includes no independent risk assessment but incorporates an abbreviated version of the TFI application that only assessed risk to construction workers and truck drivers and that, nevertheless, raised significant concerns regarding exposure. This assessment ignores several significant pathways of concern – including the reclaimer scenario – that EPA required assessment of in prior rulemakings. SC&A's independent evaluation of the TFI application is also ignored, even though that assessment forms the basis for this pilot project. Many of these pathways exceed the regulatory risk threshold and present a greater risk than placement in the stack.

It is arbitrary to conclude that "the location of the pilot project changes the consideration of the reclaimer scenario" because the purpose of the pilot project is to validate the proposed use for

[67] 57 Fed. Reg. at 23310.
[68] *Id*. at 23308.
[69] U.S. EPA, Potential Uses of Phosphogypsum And Associated Risks, Background Information Document, at 4-10 (May 1992).
[70] 57 Fed. Reg. at 23311.
[71] U.S. EPA, Letter to Corey Rosenbusch re: Approval of Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206 (Oct. 14, 2020). ("At the EPA's request, the Revised he Revised Request also addressed risks to persons living on abandoned, reused or reclaimed roads.").
[72] SC&A, Inc., Technical Review of The Fertilizer Institute Risk Assessment For Additional Use of Phosphogypsum In Road Base, at 38 (June 10, 2020).

broader application beyond the confines of a fertilizer industry plant.[73] Nor can EPA argue that, because the site of the project itself is already radioactive, the agency need not evaluate reclaimer. EPA previously found this pathway to be "significantly above" even the unlawful risk of 3 in 10,000, but now seeks to seeks to exclude its consideration in a project claimed to be the next step toward "full scale implementation." EPA cannot pick and choose which routes of exposure it will evaluate based on site-specific characteristics as this project, by nature, has implications for future requests.

Further, TFI's application failed to assess the full range of pathways and durations. For example, TFI's application only calculated risk to road users who spent 500 hours per year on the road, ignoring taxi drivers, mailman, pizza delivery, local delivery, heavy-duty truckers, and occupational drivers that spend upwards of 3,000 hours a year on the road.[74] Road construction workers were also assessed as a monolith, failing to account for different exposure pathways associated with different jobs. Specifically, backhoe operators exposed to undiluted phosphogypsum are at greater risk of exposure that could exceed even the arbitrary risk threshold of 3 in 10,000 in just 8 years.[75] Consumption of crayfish was also found to present dose risk "so large that TFI should be requested to further investigate" given that even a conservative estimate found exposure risk about 5,800 times higher than the already inflated, unlawful upper-risk level cited by EPA.[76] Because of these concerns and deficiencies in TFI's application, even if it were incorporated by reference, EPA cannot rely on its methodologies to approve Mosaic's application.

Mosaic's application also entirely ignores groundwater exposure, where SC&A evaluated four scenarios of groundwater infiltration for TFI's application. Even though this assessment incorporated arbitrarily limits on exposure amount and time, two showed lifetime cancer risks above the 1 in 10,000 presumptive safe risk threshold.[77] Mosaic's inclusion of groundwater monitoring implicitly recognizes the threat of groundwater infiltration of radionuclides, and yet no assessment of this pathway is performed. Whatever groundwater monitoring that is recommended is not sufficient to support conclusions of full-scale road implementation,[78] and without assessment of the groundwater pathway, EPA cannot approve this proposed use.

EPA is correct in noting that the karst environment could enhance transport and radionuclide mobility but is incorrect in restating the indefensible claim that it would take 10,000 years for any contaminant to migrate to groundwater.[79] There are real-world examples of radioactive contaminants migrating such distances and contaminating water bodies in periods of a few decades. For example, similar claims were made that it would take 10,000 years for the

[73] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 20 (Oct. 1, 2024).
[74] *See* SC&A, Inc., Technical Review of The Fertilizer Institute Risk Assessment For Additional Use of Phosphogypsum In Road Base (June 10, 2020).
[75] *Id*. at 46.
[76] *Id*. at 44.
[77] *Id*. at 36.
[78] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 22 (Oct. 1, 2024) ("[T]he eighteen-month sampling duration proposed by Mosaic may not necessarily be sufficient to support conclusions about longer term use in a full-scale project.").
[79] *Id*. at 20.

plutonium to migrate out of the trenches at the Maxey Flats, Kentucky "low level radioactive waste" disposal site, but it migrated in ten years, and the site became a Superfund site.[80]

Finally, the exposure assessments relied upon by this application are based on pristine conditions for the road at installation and do not adequately take into account what happens as the road ages; cracks; crumbles; develops potholes; is influenced by land subsidence or sinkholes; is eroded by weather like storm surge; high tide and rain; and otherwise degrades. These reasonably foreseeable circumstances increase the radioactive particulates emitted into the air, water, and land, by passing vehicles or otherwise, whereby they can be inhaled by people, deposited on soil near residents, or leached into groundwater and surface water. EPA cannot ignore significant routes of exposure, just as it cannot ignore the realities of road construction and degradation. For all these reasons, EPA cannot rely on the TFI assessment to approve Mosaic's application.

e. EPA arbitrarily accepted a risk calculator that it has never used in the context of the Clean Air Act without any justification and in violation of scientific integrity policies.

Mosaic's application also relies on Residual Radiation codes (known as "RESRAD") as its primary model to assess risk, as it once again attempts to incorporate by reference TFI's analysis. EPA has its own model, the Preliminary Remediation Goal Calculator, and a variant of it, the Preliminary Remediation Goal Calculator for Outdoor Surfaces (hereafter "PRG Calculators")[81]

EPA's Superfund office, which created and is responsible for the PRG Calculators, generally prohibits the use of RESRAD, unless its use in specific circumstances can be demonstrated to be consistent with the PRG Calculators.[82] More importantly, RESRAD has undergone insufficient levels of review, especially when compared to the PRG calculator. RESRAD has only had 3 verifications reviews, 1 for RESRAD-OFFSITE, and 2 for RESRAD-BUILD.[83] None of the RESRAD codes have undergone independent peer review, and more importantly, none of these deficiencies were addressed by EPA in its review of the application.

While we acknowledge that the PATHRAE model – which was used in the 1992 assessment – may be incompatible with modern hardware, the 2005 Workbook lists preferred models – COMPLY-R, CAP-88, and EPACMTP – that should be selected when estimating risk.[84] Section 5.2 notes that "if you decide to use a different model, you must send us an electronic copy of the model, a user's manual, and verification and validation information, at a minimum" which allows EPA to "review the information and let you know if it is appropriate for conducting a risk assessment."[85] EPA has not included any information as to why it has switched from PATHRAE

[80] U.S. EPA, Record of Decision Summary of Remedial Alternative Selection Maxey Flat Disposal Site, Fleming County, Kentucky, at 12-14 (1991).
[81] U.S. EPA, PRG Home, https://epa-prgs.ornl.gov/radionuclides/.
[82] U.S. EPA, Memorandum: Distribution of the "Radiation Risk Assessment at CERCLA Sites: Q&A", at 6-20 (June 13, 2014), https://semspub.epa.gov/work/HQ/176329.pdf.
[83] RESRAD Family of Codes, *available at*: https://resrad.evs.anl.gov/documents/. It is not immediately apparent what whether RESRAD-BUILD, RESRAD-OFFSITE, or RESRAD-ONSITE were utilized in this assessment.
[84] U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 17 (Dec. 2005).
[85] *Id.* at 15.

to RESRAD, or further why it now adopts RESRAD over the previously preferred models despite the lack of peer review.[86]

While RME is the incorrect metric for this assessment, assessments under an RME framework also wholeheartedly reject usage of RESRAD, creating inherent inconsistency in EPA's analysis. RESRAD is a code developed for compliance with Nuclear Regulatory Commission regulations for decommissioning licensed sites and is aimed a protecting the "Average Member of the Critical Group," instead of the protection of the Reasonable Maximum Exposed individual.[87] Assessment of RME requires the use of the PRG Calculators in its risk assessment,[88] which finds cancer risks orders of magnitude higher. Even if the road footprint was reduced to 50 meters squared, the PRG Calculators indicate a risk of 1.03 x 10^{-3} for an outdoor worker, or 1 in 1000:

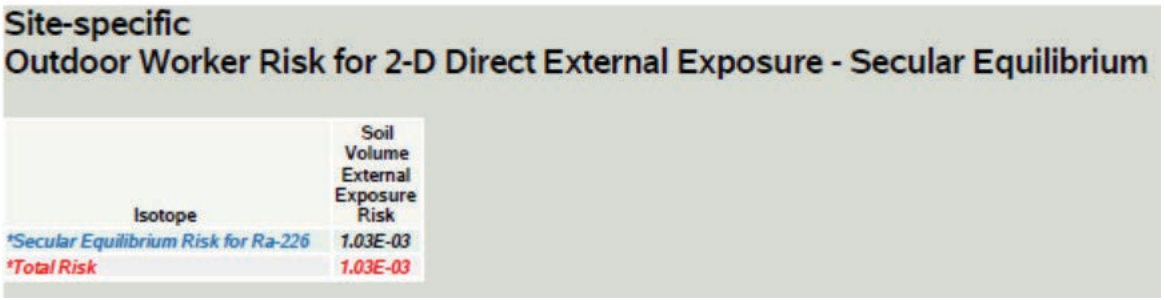
Site-specific
Outdoor Worker Inputs

Variable	Outdoor Worker 2-D External Default Value	Site-Specific Value
Cover layer thickness for GSF (gamma shielding factor) cm	0 cm	0 cm
ED_{ow} (exposure duration - outdoor worker) yr	25	25
EF_{ow} (exposure frequency - outdoor worker) day/yr	225	225
ET_{ow} (exposure time - outdoor worker) hr/day	8	8
t_{ow} (time - outdoor worker) yr	25	25
TR (target cancer risk) unitless	1.0E-06	1.0E-04
Slab size for ACF (area correction factor) m^2	1000000 m^2	50 m^2

Site-specific
Outdoor Worker PRGs for 2-D Direct External Exposure - Secular Equilibrium

Isotope	Soil Volume PRG TR=1.0E-04 (pCi/g)	Soil Volume PRG TR=1.0E-04 (mg/kg)
Secular Equilibrium PRG for Ra-226	*3.41E+00*	*3.45E-06*

[86] *See also* U.S. EPA, Correcting Some Misconceptions About EPA's Superfund Approach for Radiation Risk Assessment (Jan. 31, 2024), https://www.clu-in.org/conf/tio/RadRA/slides/1Slide_Presentation_for_Correcting_Misconceptions_about_EPA%27s_Superfund_Approach_for_Radiation_Risk_Assessment.pdf.
[87] 10 C.F.R. § 20.1402; *See also* U.S. NRC, Staff Perspective on Use of Models/Codes for Risk-Informed Decision-Making in License Termination, at 3 (May 22, 2019).
[88] "PRG calculator receptor is a highly exposed individual (Reasonable Maximum Exposure Scenario) not average individual (e.g., average member of the critical group)." U.S. EPA, Correcting Some Misconceptions About EPA's Superfund Approach for Radiation Risk Assessment, at 35 (Jan. 31, 2024).



Site-specific
Outdoor Worker Risk for 2-D Direct External Exposure - Secular Equilibrium

Isotope	Soil Volume External Exposure Risk
*Secular Equilibrium Risk for Ra-226	1.03E-03
*Total Risk	1.03E-03

For the foregoing reasons, approval of this flawed application would contravene the APA and CAA. It will also ultimately set the standard for how EPA conducts its risk assessments under section 61.206 moving forward. EPA cannot ignore the amalgamation of errors while creating problematic precedent.

V. The Application and EPA's Approval Does Not Contain Necessary Elements Required by CAA.

The Clean Air Act governs applications for other uses of phosphogypsum.[89] Mosaic's application fails to comport with the requirements of section 61.206(b)(1)-(10) in several meaningful ways. Also explained above, the application fails to adequately provide "an estimate of the maximum individual risk," or "the average radium-226 concentrations." Additionally, EPA's technical review falls short of regulatory requirements and arbitrarily departs from previous agency practices.

a. The application violates the requirements of section 61.206(b)(8) by failing to provide "an estimate of the maximum individual risk.

Mosaic impermissibly relies on a risk assessment not currently pending before the Agency, claiming its methodology has already been approved.[90] Mosaic attempts to "incorporate by reference" a previous application submitted in October 2019 and revised in April 2020 by a separate entity, TFI,[91] despite knowing approvals for the 2020 revised application were withdrawn for a failure to provide site-specific details.[92] Moreover, the "analysis" that was completed by the applicant for this request arbitrarily restricts review in several ways that fundamentally undermine the objective of a "pilot project."

The application falls significantly short of providing "[a]n estimate of the maximum individual risk, risk distribution, and incidence associated with the proposed use, including the ultimate disposition of the phosphogypsum or any product in which the phosphogypsum is incorporated.[93] At most, Mosaic consistently "scales" scenarios "as presented in the 2019 TFI risk

[89] 40 C.F.R. § 61.206
[90] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 5 (March 31, 2022).
[91] *Id.* at 2.
[92] *Id.* at 10.
[93] 40 C.F.R. § 61.206(b)(8).

assessment."[94] The application does not provide its own risk analysis, confirmed by EPA's technical review which states "Table 2, below, summarizes the risk ranges for the scenarios discussed above as calculated by both EPA and TFI."[95] Again, Mosaic is the current applicant, not TFI. Therefore, Mosaic is required by law to—but did not—provide its own risk analysis.

EPA attempts to remedy the deficient application by assessing some individualized risks for Mosaic. But EPA's after-the-fact analyses do not change the fact that Mosaic's application fails to meet the legal requirements. Moreover, EPA fails to resolve all of the application's deficiencies.

For example, EPA recognizes that the TFI risk assessment and Mosaic's "comparison" assumes a Radium-226 concentration of 27 pCi/g.[96] EPA generously adjusted "each risk calculation to the higher concentration" of 35 pCi/g,[97] which has been the standard since the 1992 decision. EPA catches that the applicant further "scaled down" the 2019 TFI risk determination for construction workers from a five-year exposure to one-month, a reduction in the total dose by a factor of 60.[98] EPA then attempts to rest on the calculations completed for the 1992 BID to allege whatever risk is posed to construction workers is below the unlawful risk threshold of 3 in 10,000.

EPA also notes that the applicant "did not quantify the exposure to a road user,"[99] based on this project's private land site. Mosaic does, however, attempt to claim *if it did* evaluate the risk, it would "result in dose and exposures much less than those estimated in the 2019 risk assessment" due to the smaller size of the road.[100] EPA took the role of applicant once more, "scaling" potential risk for the applicant by comparing the 1992 BID and 2019 TFI risk analyses to conclude the risk would be acceptable. EPA did this work for the applicant again in the context of "nearby resident" to find "[a]ny risk to the nearest resident from phosphogypsum would be caused primarily by the volume of phosphogypsum remaining on the stack, supporting the concept that inclusion of phosphogypsum in the pilot project is 'at least as protective' as maintaining it in the nearby stack."[101]

Finally, EPA recognizes that the applicant declined to evaluate the "reclaimer scenario", which was previously calculated to be "significantly above" even the unlawful risk of 3 in 10,000. While TFI's previous request attempted to demonstrate that manipulating the inputs could yield a more favorable outcome than what was determined in the 1992 BID risk assessment, Mosaic declined to consider it at all.[102] The rationale was that, "given the size of the proposed test road and the observation that the test road will be constructed on Mosaic's property, a reclaimer

[94] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 18 (Oct. 1, 2024).
[95] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 17 (Oct. 1, 2024).
[96] *Id.* at 16.
[97] *Id.*
[98] *Id.* at 18.
[99] *Id*.
[100] *Id.*
[101] *Id.* at 20.
[102] *Id*. "TFI presented an alternate scenario in which construction techniques, favorable radon transport conditions, and a lower residence time on the site resulted in a lower lifetime cancer risk to the reclaimer."

scenario is not reasonably plausible."[103] Rather than compelling evaluation of the reclaimer scenario as EPA did when TFI first declined to evaluate the pathway,[104] EPA is permitting this glaring exclusion with a different rationale than the industry. EPA found that, because the "project site is located in the immediate proximity (.805 km) of an existing phosphogypsum stack" and "on land which has been mined for phosphate ore and reclaimed" the reclaimer scenario "would not significantly change site characteristics or create additional risk to a future trespasser, reclaimer, or other member of the public." In other words, EPA found that the unique site chosen already poses such a threat from radioactivity that the risk analysis is moot.

EPA's analysis is unlawful and misguided. As stated above, a risk analysis and technical review must align with EPA's previous methodologies. It is unlawful for EPA to perform an applicant's task for it, then claim the application satisfies the requirements of section 61.206. Moreover, it is unlawful to blatantly disregard exposure timelines, radium concentrations, and exposure pathways relied on when EPA first prohibited this use.

b. Mosaic did not comply with the radium concentration testing requirements prior to submission of the application.

Section § 61.206(b)(1)(6) requires an applicant provide the "average concentration of radium-226 in the phosphogypsum to be used." The Petition Completion Checklist included in the 2005 Workbook states that "[t]he sampling must have been done within the past 12 months according to the procedures in 40 CFR 61.207," and the applicant must include "a copy of the necessary 40 CFR 61.208 certification with [its] petition."[105]

The applicant did not test the average concentration of radium-226 in the phosphogypsum to be used prior to submitting the application. Instead, applicants rely on testing performed in September 2019 for TFI's application, claiming the "[t]he Petition Completeness Checklist included in the guidance exceeds the legal requirements of the regulation."[106] Mosaic then provided, and EPA erroneously accepted, a singular table which contains "summary data." EPA found this bare-bones table, provided without conformance to the procedures in §61.207-8, "adequate for the purposes of reviewing the small-scale pilot project."[107]

EPA's attempted justification is that "the risk assessment scenarios reviewed by EPA are based on Radium-226 activity concentration values that are "roughly double the average value" reported by Mosaic.[108] As noted above, EPA's previous analysis showed Ra-226 concentrations in Central Florida phosphogypsum can be eight times what the applicant advances in the unverifiable table. While testing and compliance with §61.207-8 prior to removal is *another*

[103] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 20 (Oct. 1, 2024).
[104] U.S. EPA, Letter to Corey Rosenbusch re: Approval of Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206 (Oct. 14, 2020). ("At the EPA's request, the Revised he Revised Request also addressed risks to persons living on abandoned, reused or reclaimed roads.").
[105] U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 30 (Dec. 2005).
[106] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 11 (Oct. 1, 2024).
[107] *Id*.
[108] *Id*. at 12.

requirement of the regulations, it is absurd to view it as the only testing requirement. It is equally absurd to find "conclusions of the risk assessment will remain valid even if the Ra-226 activity in the phosphogypsum that is used turns out to be higher" than advanced in the application.[109]

The use of phosohogypsum in road construction was previously determined to present an "unacceptable level of risk to public health" because "regardless of the radium-226 concentration, the use of phosphogypsum in road construction always resulted in a MIR significantly greater than the presumptive safe level.[110] EPA found that "even at radium-226 concentrations 3pCi/g, the risk to the maximum exposed individual is well above the acceptable level."

Cancer risks are a simple calculation of exposure + toxicity. EPA and mosaic have manipulated both inputs to achieve a cancer risk estimate far lower than what EPA found when independently analyzing this proposed use. EPA and Mosaic admit key exposure pathways were eliminated from consideration, and the application fails to adequately provide the toxicity testing.

EPA's selective reliance on its 2005 guidance document and unquestioning acceptance of Mosaic's proffered sampling data is arbitrary and unlawful.

VI. The Site Chosen and Associated Limitation of Risks Analyzed Contradicts the Purpose of a Small-Scale Pilot Project.

Small-scale, pilot projects are the "intermediate step between laboratory testing and full-scale implementation of the alternative use."[111] As EPA and the application notes, the small-scale study "is designed to simulate alternative use conditions as much as possible" and "the study will consist of a field test demonstrating how the proposed alternative would function and a control test to generate baseline conditions."[112]

Mosaic recognizes that this application serves a different goal, stating "the purpose of the project is to demonstrate the use of PG as feedstock in road base as an approved alternative to the current regulatory requirement that PG must be stored in stacks."[113]

Alternative uses may only be approved where EPA Assistant Administrator of the Office of Air and Radiation determines the proposed use is at least as protective of public health, in both the short and long term, as disposal in a stack or mine.[114] Despite this well known, decades old requirement, Mosaic failed to provide a full site-specific risk analysis. The analysis that was provided excluded several pathways from consideration; tellingly, the pathway previously calculated to be "significantly above" even the unlawful risk of 3 in 10,000.

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[109] *Id.* at 11.
[110] 57 Fed. Reg. at 23311-12.
[111] U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 9 (Dec. 2005).
[112] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 3 (March 31, 2022).
[113] Letter from Pat Kane, Mosaic Fertilizer, LLC to Jonathan Walsh, U.S. EPA re: Request for Approval of Use of Phosphogypsum in Small-scale Pilot Project; November 27, 2023, Meeting; Response to Questions (Mar. 17, 2023).
[114] 40 C.F.R. § 61.206(a)-(c) (emphasis added).

The justification for these exclusions was consistently based on the unique nature of the site chosen. For example, Mosaic claims and EPA agrees "that the location of the pilot project changes the consideration of the reclaimer scenario." The reclaimer pathway was completely excluded because the pilot project is "on land which has been mined for phosphate ore and reclaimed," and "in the immediate proximity (.805) of an existing phosphogypsum stack."

EPA notes the reclaimer scenario may be reviewed again in the future, finding approval of this pilot project "does not imply any conclusions about the risks to future reclaimers at other sites, which may be further from phosphogypsum stacks and may lack the institutional controls present at the Mosaic facility."[115]

For the "nearby resident" pathway, EPA found "[a]ny risk to the nearest resident from phosphogypsum would be caused primarily by the volume of phosphogypsum remaining on the stack, supporting the concept that inclusion of phosphogypsum in the pilot project is 'at least as protective' as maintaining it in the nearby stack."[116] For water pathways evaluated, EPA found that Mosaic's limited eighteen-month sampling duration "may not necessarily be sufficient to support conclusions about longer term use in a full-scale project."[117]

Clearly, this project is not "designed to simulate alternative use conditions as much as possible."[118] The project site is on private land, previously mined for phosphate ore and reclaimed, boasting an 854 acre – and growing – phosphogypsum stack.[119] Few sites could be less reflective of alternative use conditions should this pilot project serve as the "intermediate step between laboratory testing and full-scale implementation."

Additionally, there are no long-term testing structures in place to ensure to ensure the project "is at least as protective of public health, in both the short ***and long term***, as disposal in a stack or mine."[120] "The pilot road will only be monitored "before and during construction, and for at least six months after construction."[121] Construction workers and truck drivers are only analyzed for the construction period, and groundwater will only be analyzed for "at least 6 months" after constriction. According to the available documents, this road could be completely abandoned after the 6-month study period is over as the application does not fully provide the "ultimate disposition" of the phosphogypsum to be used as required by the 2005 Workbook, only the

[115] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 21 (Oct. 1, 2024).
[116] *Id*. at 20.
[117] *Id*. at 22.
[118] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 3 (March 31, 2022).
[119] Florida Dept. of Envtl. Prot., Notice of Draft Permit, at 7 (Oct. 11, 2024) *available at*: https://prodenv.dep.state.fl.us/DepNexus/public/electronic-documents/MMR_FL0036421/%7B%22catalogId%22:%2226%22,%22guid%22:%2226.113545.1%22%7D.
[120] 40 C.F.R. § 61.206(c) (emphasis added).
[121] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 36 (March 31, 2022).

disposition of the unused waste.[122] If the site will not be abandoned, then regular maintenance and upkeep exposure for utility workers must be factored into the analysis.

Mosaic correctly claims in its application the "purpose of the small-scale pilot is to demonstrate the range of [phosphogyopsum] road construction designs that meet the Florida Standard Specifications for Road and Bridge Construction."[123] Other stated "pilot objectives" include "[c]ollect data to assist in future pg recycling efforts" and to "evaluate the use of pg as an ingredient in a blended road base." This commentary exhibits the confusion both Mosaic and EPA have regarding this application and regulatory requirements.

A small-scale pilot project demonstrating the efficacy of a proposed "other use" of phosphogypsum is not a demonstration of the suitability of this material for road construction. This decision impacts human health and safety and the environment.

A pilot project cannot be used as a justification to disregard key pathways of concern, regardless of the characteristics of the site chosen. Otherwise, the project cannot be reasonably seen as "designed to simulate alternative use conditions as much as possible." Approving a "pilot" project on industry land, relying on industry methodology, and claiming risks need-not be analyzed as a result intentionally frustrates the claimed purpose of the project.

VII. This Project Does not Confer a Benefit to Public Health from the Proposed Use.

Mosaic's petition fails to include a discussion of the benefit to public health from the proposed use relative to leaving the phosphogypsum in the stack. A small-scale study is meant to "validate the proposed use" by demonstrating that the use "produces sufficient benefit to the exposed individuals or to society to offset the radiation detriment."[124] As discussed above, this project is not an assessment as to the public health from radon exposure, but merely the suitability and feasibility of building a road out of phosphogypsum pursuant to Florida Department of Transportation specifications. Confirming "feasibility" does not confer a benefit to the public.

Mosaic is correct in asserting that phosphogypsum stacks "are creating environmental, land use and viewshed concerns," but incorrect in implying that EPA's approval will lead to any substantial reduction in stacks.[125] 46 million tons of phosphogypsum are produced each year in the United States, with another 1.7 billion already placed in stacks across the country.[126] Even an extremely comprehensive scheme of phosphogypsum removal for use in roadways, utilization would not nearly catch up with output. As of 2020, China has attempted full-scale utilization of

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[122] *See* Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206 (March 31, 2022); U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 5 (Dec. 2005).
[123] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 4 (March 31, 2022).
[124] U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 11 (Dec. 2005).
[125] Mosaic Fertilizer, LLC, Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. § 61.206, at 19 (March 31, 2022).
[126] *Id*.; FIPR Institute, Phosphogypsum Stacks, https://fipr.floridapoly.edu/about-us/phosphate-primer/phosphogypsum-stacks.php.

phosphogypsum without regard for human health and the environment but found that annual production of 75 million tons per year was not out paced by the 31 million tons of utilized.[127]

China's failed implementation process that increased radiological risk to the public is not the answer. Nor is widescale implementation of road construction in phosphogypsum the solution to gyptacks that continue to grow year after year despite emerging technology limiting the creation of this radioactive waste. Proper management of this waste starts with a revisitation of the Bevill Determination and resolution of the inconsistent patchwork of federal and state regulation governing gypstacks.

VIII. EPA Contravenes RCRA by Failing to Assess Non-Radiological Risk From New Wales Phosphogypsum.

EPA acknowledges that "non-hazardous materials may still pose a risk" to human health and the environment, finding that its own review was "not a substitute a substitute for a complete consideration of environmental health and safety."[128] EPA has in fact already concluded that "phosphogypsum . . . poses potential health and environmental problems" and that existing regulation at both the state and federal level are inadequate to address contaminant release and groundwater infiltration.[129] The New Wales stack itself is operating under a consent decree to address the illegal commingling of hazardous waste and phosphogypsum.[130] Nonetheless, EPA declined to even consider the potential implications of its actions, ignoring its obligations under RCRA and "entirely fail[ing] to consider an important aspect of the problem."[131]

RCRA is a "comprehensive environmental statute that governs the treatment, storage, and disposal of *solid* and hazardous waste."[132] Even with EPA's approval, an industrial waste like phosphogypsum that is speculatively accumulated and eventually repurposed is still considered a discarded solid waste when it is placed outside of the stack systems.[133] Phosphogypsum may be exempt from the regulatory definition of hazardous waste though the Bevill Determination, but it nonetheless presents hazardous characteristics and contains toxic constituents that "could pose significant threats to human life and the environment."[134]

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[127] Economic Daily, Is the "slag mountain" by the Yangtze River solid waste or unpolished jade? Investigation on the pollution and comprehensive utilization of phosphogypsum storage (Dec 2020), http://www.xinhuanet.com/politics/2020-12/21/c_1126885088.htm. ("However, facing the stockpile of 600 million tons and the annual production of 75 million tons, the annual use of phosphogypsum is currently only 31 million tons. The speed of comprehensive utilization still cannot catch up with the output.").
[128] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 22 (Oct. 1, 2024).
[129] 56 Fed. Reg. at 27315.
[130] U.S. EPA, Mosaic Fertilizer, LLC Settlement, *available at:* https://www.epa.gov/enforcement/mosaic-fertilizer-llc-settlement.
[131] *Motor Vehicle Mfrs. Ass'n v. State Farm Mutual Automobile Ins. Co.*, 463 U.S. 29 (1983).
[132] *Meghrig v. KFC W., Inc.*, 516 U.S. 479, 483 (1996) (emphasis added).
[133] 40 CFR § 261.2; *Association of Battery Recyclers, Inc. v EPA*, 208 F.3d 1047, 1050 (D.C. Cir. 2000); see *also Talarico Bros. Bldg. Corp. v. Union Carbide Corp.*, 73 F.4th 126 (2d. Cir 2023) (finding that improper management of radioactive slag could constitute improper disposal under RCRA.).
[134] *Talarico Bros. Bldg. Corp.* 73 F.4th at 138 (citing H.R. Rep. No. 94-1491(I) at 4).

Among these toxic constituents, long-term chronic exposure to arsenic has been linked to lung cancer, and ingestion of water contaminated with arsenic may result in manifestations of toxicity all over the body.[135] Chronic lead exposure is toxic in every human organ system that has been studied, and "no safe blood lead level in children has been identified."[136] People exposed to elevated air concentrations of selenium have reported dizziness, fatigue, and irritation of mucous membranes.[137] Chronic exposure to low levels of cadmium in the air can lead to kidney disease and damage to lungs and the nasal cavity.[138] Chromium compounds are carcinogenic to humans.[139]

In its 2005 Workbook, EPA requires evaluation of "toxic or hazardous constituents of the waste" to "assure that the proposed use does not cause non-radiological risk to human health and the environment."[140] Instead of providing this information for the current application, Mosaic instead incorporates by reference an assessment from TFI's 2019 application. Appendix 3 includes only a general overview of contaminants worldwide. The only two Florida surveys are represented by a study that is 40 years old – May and Sweeney (1984) – that did not include survey of the New Wales stack at issue.[141] Survey information from New Wales comes from a master's thesis that is 13 years old – Mostary (2011) – that only included 12 total samples and that specifically noted "in terms of risk assessment, from a direct human exposure pathway, arsenic was found to be the most limited element."[142] This limited, outdated review of the stack system is not the site-specific evaluation of New Wales phosphogypsum that EPA requires under its 2005 Workbook, nor will it allow EPA to meaningfully assess non-radiological risks in its approval to prevent an imminent and substantial endangerment.[143]

After-the-fact monitoring for an extremely limited duration for certain "non-radiological parameters" does nothing to relieve this risk and will not reverse damage already done if

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[135] Hughes, J.P., Polissar, L., Van Belle, G., Evaluation and Synthesis of Health Effects Studies of Communities Surrounding Arsenic Producing Industries, Int J Epidemiol, 407-13 (June 1998), https://doi.org/10.1093/ije/17.2.407
[136] U.S. ATSDR, Toxicological Profile for Lead, at 3 (Aug. 2020) *available at:* https://www.atsdr.cdc.gov/toxprofiles/tp13.pdf.
[137] U.S. ATSDR, Toxicological Profile for Selenium, at 5 (Sept. 2003) *available at*: https://www.atsdr.cdc.gov/toxprofiles/tp92.pdf.
[138] U.S. ATSDR, Toxicological Profile for Cadmium, at 4 (Sept. 2012) *available at*: https://www.atsdr.cdc.gov/toxprofiles/tp5.pdf.
[139] U.S. ATSDR, Toxicological Profile for Chromium, at 4 (Sept. 2012) *available at*: https://www.atsdr.cdc.gov/toxprofiles/tp7.pdf.
[140] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 22 (Oct. 1, 2024); U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 9 (Dec. 2005).
[141] *See* Exponent, Appendix 3 Human Health Risk Screening for Metals and Metalloids: Phosphogypsum in Road Construction, https://www.epa.gov/sites/default/files/2020-10/documents/appendix_3_-_metals_risk_screening_1.pdf; *see also* Alexander May & John W. Sweeney, May, Assessment of environmental impacts associated with phosphogypsum in Florida, 90 J. OF ENVTL. MGMT. 116 (1984).
[142] Mostary, Shabnam, Trace Metals Leachability Characterization of Phosphogypsum, at 100 (2011), https://ufdcimages.uflib.ufl.edu/UF/E0/04/30/79/00001/mostary_s.pdf.
[143] Harm from this project is "imminent," in that "a reasonable prospect of future harm" exists that "is adequate to engage the gears of" RCRA. *Simsbury-Avon Pres. Club, Inc. v. Metacon Gun Club, Inc.*, 575 F.3d 199, 211 (2d Cir. 2009). An imminent hazard does not require that an immediate showing of harm so long as the risk of threatened harm is present. *Dague v. City of Burlington*, 935 F.2d 1343, 1356 (2d Cir. 1991). A "substantial" endangerment is also not a particularly high bar, but there must be a reasonable "cause for concern that someone or something may be exposed to the risk of harm." *Burlington N. and Santa Fe Ry. Co. v. Grant*, 505 F.3d 1013, 1021 (10th Cir. 2007)

contaminants from this road project leach into environment.[144] EPA not only arbitrarily ignores this substantial risk, but contravenes RCRA's purpose to "promote the protection of health and the environment . . . by assuring that hazardous waste management practices are conducted in a manner which protects human health and the environment."[145]

IX. EPA's approval fails to consider site-specific instability at the New Wales Plant where additional stress could lead to catastrophic failure.

The New Wales stack has an extensive history of environmental issues that have endangered the public. New Wales suffered massive sinkholes in 1994, 2004, 2013, and 2016, with the most recent reported sinkhole causing 215 million gallons of acidic process water and an unknown quantity of radioactive phosphogypsum to collapse into the Floridan aquifer.[146] That toxic waste remains in the aquifer to this day, even as 4,000 gallons per minute are pumped from recovery wells in attempts to recover contaminated groundwater from the aquifer.[147]

In 2022, seismic activity demonstrating the potential to "adversely affect the integrity of the stack" drove on-site construction of stack expansions to a halt.[148] While seismic activity has been continuously reported at the stack since, engineers have also observed and reported unexplained changes in water levels at reservoir ponds that hold millions of gallons of process wastewater.[149] On March 23, 2023, the Florida Department of Environmental Protection issued a Notice of Pollution indicating that recent site monitoring is "indicative of a potential liner tear" that "could result in an indeterminate volume of process water released to the environment."[150] Mosaic would later designate the area as Area of Interest 2 ("AOI2"), which to this day has not been fully addressed. In late 2023, as EPA was considering this application, Mosaic finally confirmed that Area of Interest 4 ("AOI4") was the result of several liner tears that could potentially leak an unknown amount of process wastewater into the aquifer.[151]

EPA is reshaping the criteria of public health evaluations to become hyper focused on-site selection, directly contradicting the regulations. As noted above, if EPA is to permit extreme selectivity in the radiological risk assessment due to the unique site chosen, it should also evaluate the non-industry friendly site-specific details such as increased construction to a site with historic structural integrity concerns. This analysis is within EPA's expertise given the

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[144] U.S. EPA, Review of the Small-Scale Road Pilot Project on Private Land in Florida Submitted by Mosaic Fertilizer, LLC, at 22 (Oct. 1, 2024).
[145] 42 U.S.C. § 6902(a)(4).
[146] ABC News, Florida Fertilizer Plant Sinkhole Reportedly Leaks 215 Million Gallons of Radioactive Water Into Aquifer (Sept. 16, 2016), https://abcnews.go.com/US/florida-fertilizer-plant-sinkhole-reportedly-leaks-215-million/story?id=42138240.
[147] Consent Order, State of Florida Department of Environmental Protection v. Mosaic Fertilizer, LLC, OGC No. 16-1356 (Oct. 24, 2016).
[148] Letter from Vishwas Sathe, Fla. Dept. Envtl. Mgmt to Santino A. Provenzano, Mosaic Fertilizer, LLC (Oct. 21, 2021).
[149] Letter from Dana Ford, Mosaic Fertilizer, LLC (Mar. 24, 2022) https://prodenv.dep.state.fl.us/DepStaging/api/dms/26.104931.1.
[150] *Id.*
[151] Tampa Bay Times, Liner tear confirmed at Mosaic's New Wales 'gypstack,' Florida regulators say (March 19, 2024), https://www.tampabay.com/news/environment/2024/03/19/liner-tear-confirmed-mosaics-new-wales-gypstack-florida-regulators-say/

consent decree governing operations at this site stemming from an enforcement action for alleged illegal comingling of hazardous waste.

Subpart R requires "a description of any measures which will be taken to prevent the uncontrolled release of phosphogypsum into the environment," which would necessarily include measures to prevent unintended release from moving the "handling and processing" of phosphogypsum.[152] Mosaic did not assess the consequences of substantial increased construction activity on stack, and EPA should require such an assessment to comply with Subpart R.

X. Conclusion

EPA states "no practice involving exposure to radiation should be adopted unless it produces a sufficient benefit to the exposed individuals or to society to offset the radiation detriment it causes."[153] This project provides no net benefit to society, and erroneously claims that convenient disposal of this radioactive waste in roads will lead to a reduction in stack volume are completely unfounded. As noted above, China has authorized significant expansion of phosphogypsum in infrastructure – despite mounting environmental problems in the Yangzte River Basin – but only used 31 million metric tons of phosphogypsum in 2020, far below the 75 million metric tons produced each year and the 600 million metric tons currently in storage.[154]

Mosaic has implicitly acknowledged that roadway expansion will not reduce stacks, as it is currently in process of adding a Phase III and Phase IV expansion to its New Wales plant to account for increased production of phosphogypsum. Mosaic has also applied for multiple underground injection ("UIC") wells for process wastewater and phosphogypsum slurry, including for the New Wales facility. This is all occurring as emerging research demonstrates phosphogypsum-free fertilizer production that has not been acknowledged by industry.

Approval of this application will greenlight arbitrary methodology and lead to nationwide approval of this prohibited use. EPA's continued statements that there are currently no other pending applications denies reality, especially as trade associations continue to call for widescale implementation of phosphogypsum in roads and that Florida should prepare "for future EPA approval."[155]

It is clear that this approval offers not public benefit, but a convenient disposal option and revenue stream for an industry sough at expense of the safety of the public and the health of the environment. We therefore ask you to reject this application.

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[152] 42 U.S.C. § 61.206 (b)(2), (7).
[153] U.S. EPA, Applying to EPA for Approval of Other Uses of Phosphogypsum, at 11 (Dec. 2005).
[154] Economic Daily, Is the "slag mountain" by the Yangtze River solid waste or unpolished jade? Investigation on the pollution and comprehensive utilization of phosphogypsum storage (Dec 2020), http://www.xinhuanet.com/politics/2020-12/21/c_1126885088.htm.("However, facing the stockpile of 600 million tons and the annual production of 75 million tons, the annual use of phosphogypsum is currently only 31 million tons. The speed of comprehensive utilization still cannot catch up with the output.").
[155] Phosphate Innovation Initiative, Recycle and Rebuild, It's Time to Stop Stacking PG – And Start Using It!, https://phosphateinnovation.com/recycle-and-rebuild/.

Sincerely,

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Tab 8

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

EPA 402-R-98-007

Comments and Response to Comments

NESHAPS; National Emission Standards for Radon Emissions From Phosphogypsum Stacks

November 1998
U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Washington, D.C. 20460

PREFACE

The Environmental Protection Agency (EPA) is promulgating revisions to 40 CFR Part 61, Subpart R, National Emission Standards for Radon Emissions from Phosphogypsum Stacks. This Background Information Document (BID)–Comments and Response to Comments has been prepared in support of the final rulemaking. It contains an introduction, general comments on EPA's approach, laboratory research and development, including sampling and certification, use outside a laboratory setting, and sampling statistics.

Copies of this BID, in whole or in part, are available to all interested persons. For additional information, contact Eleanor Thornton-Jones at (202) 564-9773 or write to:

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Washington, D.C. 20460

An EPA contractor, S. Cohen & Associates, Inc., McLean, VA, provided significant technical support in the preparation of this BID.

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An EPA contractor, S. Cohen & Associates, Inc., McLean, VA, provided significant technical support in the preparation of this BID.

Response to Comments on Amendments to Subpart R

INTRODUCTION

The Environmental Protection Agency (EPA) is promulgating revisions to those portions of its National Emission Standards for Hazardous Pollutants (NESHAPs) that address radon-222 emissions from phosphogypsum stacks, 40 CFR part 61, Subpart R (Subpart R) which concern: 1) the distribution and use of the substance, phosphogypsum, for indoor research and development purposes; 2) the sampling and measurement of radium-226 in phosphogypsum; and 3) use of phosphogypsum for outdoor agricultural purposes. EPA is taking this action in response to issues raised in a petition for reconsideration from The Fertilizer Institute (TFI) which questioned aspects of the risk assessment EPA performed in support of the rulemaking that revised Subpart R in 1992. The risk assessment was an evaluation of the risk to persons who perform research and development activities in a laboratory using phosphogypsum. Phosphogypsum -- a byproduct of the wet-acid process of producing phosphoric acid from phosphate rock -- contains naturally occurring radiation emitted by uranium-238 and its decay products such as radium-226 and radon-222. Exposure to the radiation emitted by these and other radionuclides in phosphogypsum can increase an individual's probability of developing cancer.

EPA published a notice of proposed rulemaking on May 8, 1996 and solicited comments. See 61 FR 20775, May 8, 1996. A total of 107 general and specific comments were received by the docket and at the subsequent public hearing in Florida from 19 organizations and private citizens. A small number of these comments were procedural in nature, requesting a public hearing, asking that the comment period be extended, and acknowledging the extension of time to submit comments. The request for a public hearing was granted. The vast majority of the comments dealt with policy, legal and technical issues.

Comments are presented here in summary form under four categories that best describe their content:

1. General Comments on EPA's Approach
2. Laboratory Research and Development, including Sampling and Certification
3. Use Outside a Laboratory Setting
4. Sampling Statistics

1. General Comments on EPA's Approach

Comment 1.a: EPA's authority under the Clean Air Act is limited to ambient air. Air inside laboratories does not fall within the Clean Air Act definition of ambient air, so EPA has no authority to regulate the laboratory research and development uses of phosphogypsum. (TFI)

Response: This rulemaking is limited to reconsideration of certain specified issues, including the amount of phosphogypsum that can be removed from stacks for use in research and development and correction of the formula used to demonstrate that phosphogypsum removed from a stack for agricultural purposes meets the 10 pCi/g limit. This comment addresses an issue presented by the Subpart R rule promulgated in 1992 which is not among those under reconsideration in this rulemaking. In any case, the commenter misunderstands the structure of the rule. When EPA first promulgated Subpart R in 1989, it required that radon emissions be controlled by placement of all phosphogypsum in a stack or mine. In response to that general prohibition, many parties argued that it would effectively preclude other existing uses of phosphogypsum in activities such as agriculture and research and development. In order for such uses to be permissible, it was then necessary for EPA to make specific exceptions to the general requirement that all phosphogypsum be disposed in stacks or mines, which EPA had determined would protect public health with an ample margin of safety. EPA concluded that it would be inappropriate to amend the 1989 NESHAP to permit any alternative disposition of phosphogypsum if that alternative would present potential health risks from radon emissions greater than those EPA would consider legally permissible as part of disposal. If EPA were not permitted to establish procedures governing distribution of phosphogypsum removed from a stack which would assure that exceptions to the general requirement of disposal in a stack or mine would not themselves result in unacceptable health risks, EPA believes that it would be irresponsible to permit such exceptions. Thus, analysis by EPA of the risks presented by laboratory use of phosphogypsum is necessary to decide under what circumstances EPA can make an exception to the general requirement that phosphogypsum be disposed of in a stack or mine, not because it is the intent of EPA to establish a NESHAP directly regulating radon emissions to air inside laboratories.

Comment 1.b: While EPA has acknowledged that its original risk assessment contained errors, the agency's response to its current risk assessment proposes that researchers demonstrate that using more than 700 pounds of phosphogypsum in a laboratory project would be "helpful." This approach is completely counter to the NESHAPs methodology set out in the *Vinyl Chloride* decision. It is not the responsibility of the regulated community to show that an erroneous limitation is a burden, but it is EPA's responsibility to determine an amount of phosphogypsum that is presumptively safe to use in research and development and then determine whether, considering all other factors, that quantity protects human health with an ample margin of safety. There is no basis for EPA to reduce the amount of phosphogypsum to be used in laboratory research and development below that which is presumptively safe. (TFI)

Response: This comment misconstrues the *Vinyl Chloride* decision. Under the methodology required by that decision, once EPA has determined the level of emissions which is presumptively

safe, EPA must then establish an additional margin of safety. In this second step, EPA is required to consider factors such as the economic feasibility of greater control. If there were no practical utility associated with the ability to use more than a specified amount of phosphogypsum in a laboratory setting, then it would be appropriate for EPA to establish a limitation which reflected this conclusion.

However, based on the record in this rulemaking, EPA has concluded that the ability to use greater quantities of phosphogypsum in a laboratory setting does have practical utility. Since the corrected risk analysis demonstrates that the use of 7,000 pounds of phosphogypsum for indoor research and development presents a lifetime risk to the maximally exposed individual which EPA has deemed presumptively safe under the applicable quantitative criteria, EPA has decided to revise Subpart R to permit such use.

Comment 1.c: EPA must consider the quantity and value of phosphogypsum in evaluating its stance on phosphogypsum research, since that research is consistent with reuse and recycling approaches to waste management. The work of the phosphate industry, FIPR, and LSU has led to many possible uses. EPA has not shown either the understanding the industry expected or provided necessary support through the regulatory process, by eliminating all research uses, then by placing very stringent limitations on research and development based on a risk assessment that the Agency acknowledges included significant errors. TFI supports the proposed modifications to the 1992 rule, but EPA should reevaluate its entire approach to phosphogypsum research and development to encourage sound research and development on reuse while still protecting human health and the environment. (TFI)

Response: EPA has determined that its approach, allowing laboratory research and development projects using limited quantities of phosphogypsum, is safe, with an ample margin of safety. This research and development has the potential for finding ways to promote reuse and recycling of phosphogypsum. In increasing the limit on the amount of phosphogypsum that can be used in research and development, the Agency is seeking to assure that the proper balance is reached between the benefits of such research and development and the risks posed by the use of phosphogypsum. In this way, EPA is promoting research and development on reuse and recycling of phosphogypsum.

Comment 1.d: EPA's proposed limitation of 7,000 pounds of phosphogypsum per laboratory is better than the former limit of 700 pounds per experiment, but the higher limit appears to be as much for EPA's enforcement convenience as for research flexibility. Enforcement convenience is not a sufficient basis for establishing regulatory limits. EPA should determine a limit per research and development project that is presumptively safe and request comments on various regulatory approaches. (TFI, IMC-Agrico)

Response: The Agency's decision to allow the use of 7,000 pounds of phosphogypsum for research and development is based on a revised risk assessment; not on enforcement convenience.

Comment 1.e: The limited and controlled nature of all three types of phosphogypsum research and development (bench scale work in labs, "pot" scale work in greenhouses, and field studies) make substantive command and control regulation unnecessary. Procedural requirements, including notice of the radionuclide content of phosphogypsum involved in particular projects, and, if necessary, deed restrictions and other notice requirements to control access to field research and development sites are sufficient to protect human health - of both researchers and the general public - with an ample margin of safety. (TFI)

Response: The Agency's policy is to establish limits on the amount of phosphogypsum that can be used in a laboratory, and to allow researchers the freedom to conduct their work within that constraint. The reporting of the radium-226 content of phosphogypsum used in research and development is no longer required. Outdoor research and development is not permitted under Section 61.205. Researchers who wish to undertake field studies utilizing phosphogypsum in a manner not permitted under Section 61.204 may apply for permission to undertake such studies under Section 61.206. Applicants under Section 61.206 are free to propose any restrictions that they believe will assure that the risk from a proposed alternative use is kept within acceptable levels.

Comment 1.f: EPA should not change the existing NESHAP to allow any increase in the quantity of phosphogypsum available for research and development uses or allow more than one project per site. There is considerable evidence that the linear non-threshold relationship is the best tool to predict the risks of radiation exposure at low doses, despite the position taken by some members of the Health Physics Society. It is more difficult to control and monitor 7,000 than 700 pounds of phosphogypsum; expanded use will increase cancers in laboratory personnel. EPA should increase, rather than decrease, restrictions on the use of phosphogypsum, or at the minimum, maintain the current restrictions, and alternative uses should not be permitted. (Envir. Confederation, Brown, Behrens, ManaSota-88)

Response: EPA has determined that 7,000 pounds in laboratory research and development use to be safe, with an ample margin of safety, so long as this limit is not exceeded for any individual research activity and no one room within the facility contains more than this limit. The Agency does not believe that facilities conducting research and development activities involving phosphogypsum will exercise any less care in storing and handling the larger quantities of material permitted under the revised NESHAP than they did in storing and handling the 700 pounds previously allowed.

Comment 1.g: New studies show that linear no-threshold assumptions are not completely accurate and grossly overestimate cancer risk. The linear no-threshold hypothesis has not been proven; research conducted and evidence obtained over the last decade calls this hypothesis into question. The Health Physics Society's recent position statement on low-level radiation exposure recommends against quantitative estimation of health risk below an individual dose of 5,000 mrem in one year or a lifetime dose of 10,000 mrem in addition to background radiation. The Society holds that risk estimation in this dose range should be strictly qualitative, emphasizing a range of

hypothetical health outcomes within an emphasis on the likely possibility of no adverse effects at all. In addition, the dose rate that has been estimated for a phosphogypsum researcher is much lower than 5,000 mrem/yr. (Simplot, Gidry)

Response: The Agency position is that the assumption of no threshold and a linear response is prudent public policy. In conducting risk assessments, EPA must take into account the limitations and uncertainties in our scientific knowledge about the effects of radiation at all levels of exposure. An annual exposure to 5,000 mrem would pose a risk far in excess of that determined to be safe, with an ample margin of safety, which is a lifetime risk to the maximally exposed individual no greater than 1×10^{-4}.

Comment 1.h: Industry should be required to use a phosphoric process that creates no phosphogypsum or other hazardous byproducts, as indicated by the Phosphoric Acid Dialogue Committee. (ManaSota-88)

Response: This comment is beyond the scope of the issues subject to reconsideration in this rulemaking. In any case, since the risks posed by releases of radionuclides from phosphogypsum can be maintained at levels that protect public health with an ample margin or safety, there is no basis for utilizing a NESHAP to prohibit the production of phosphates by the wet acid process.

2. Laboratory Research and Development, including Sampling and Certification

Comment 2.a: An aggregate limit of 7,000 pounds of phosphogypsum per facility for research purposes is better than the 700 pound limit per experiment, the 7,000 pound limit will still restrict research in removing radium from phosphogypsum. At 30 pCi/g, there are less than 10 micrograms by weight of radium-226 in 700 pounds of phosphogypsum, making separation research difficult. In 7,000 pounds, there are still less than 100 micrograms available. Milligram quantities of radium are needed for effective separation research. The larger limit also will permit experiments that are more realistic in size, providing better data and yielding results about using phosphogypsum that are more accurate. The larger amount per facility would also provide a more homogeneous supply of phosphogypsum, which is important to providing relationships among research and development projects and more flexibility in their development. A larger stockpile would also allow better control of the phosphogypsum by supporting a central controlled access area, rather than individual project storage areas. (FIPR, TFI, Scott, Gidry, Seals)

The proposed 7,000 pound limit for a given facility is preferable to setting a limit for each individual experiment. Even with this limit, the risk would be less than estimated by EPA, as no laboratory will ever have 7,000 pounds of phosphogypsum on hand every day of the year. The average amount would probably not be more than 2,000 pounds. (FIPR)

Response: The limit on the amount of phosphogypsum that can be used in a laboratory was determined to protect those researchers that work with 7,000 pounds of phosphogypsum on a

continuous basis. This 7,000 pound limit applies separately to each individual research and development activity. The final rule protects researchers in those rooms in laboratories in which 7,000 pounds of phosphogypsum is used. No more than 7,000 pounds may be stored, or in use in ongoing experiments, in any room at a research and development facility. A particular facility may possess more than 7,000 pounds of phosphogypsum for use in multiple research activities, so long as it does not exceed this limit for any individual research activity and no one room within the facility contains more than this limit.

Although it is likely that many laboratories will hold less than 7,000 pounds at any one time, much of the phosphogypsum on hand in a laboratory at a time may be in use in ongoing experiments, rather than stockpiled in barrels awaiting use.

Comment 2.b: There should be no limitation on multiple research and development activities at a single facility or by a particular principal investigator, since the actual time the investigator spends in the laboratory working with phosphogypsum is limited, usually to a maximum of 2 to 3 hours a day, less than 5 days a week, for a maximum of 150 days a year. An increase to 7,000 pounds of phosphogypsum for multiple research projects would therefore be very unlikely to result in unacceptable worker exposure. Given limited storage space in most research laboratories, phosphogypsum would not be stored in the laboratories, but brought in only on an as-needed basis. The nearly universal practice is to store phosphogypsum outside in 5-gallon pails. No more than 2 pails are in active use at any one time. (FIPR, Seals)

Response: The Agency agrees that, within the overall limit of 7,000 pounds per room, no limit on the number of research and development activities at a given facility is necessary.

Comment 2.c: Using 7,000 pounds of phosphogypsum will not appreciably increase the overall risk of working in a laboratory, when one considers other hazards such as chemical, electrical, or fire in that setting. In addition, there should be no limit on multiple research and development activities at any facility or by any investigator. EPA's indoor radon screening criterion of 4 pCi/l would allow about 500,000 pounds of phosphogypsum in a research laboratory, an essentially unlimited amount. Other radiation/carcinogen risks deemed acceptable (from air travel, food, dwelling construction) because they are so small have not been regulated. (Scott, Gidry)

Response: EPA acknowledges that working in a laboratory exposes individuals to a broad spectrum of risks. However, this does not obviate EPA's responsibility for protecting the public health of laboratory workers with an ample margin of safety. The Agency's screening level of 4 pCi/l for indoor radon was established for a different purpose. NESHAPs promulgated under the Clean Air Act Section 112 must achieve a maximum individual lifetime risk not to exceed 1×10^{-4}.

Comment 2.d: Radium extraction experiments with more than 700 pounds of phosphogypsum could cause higher exposures than simple handling and storage. There is no information about the exposures from radium extraction in the record. (ManaSota-88)

Response: The Agency does not believe that research into radium extraction would result in significantly different exposure pathways causing higher risk than those evaluated in its risk assessments for other research and development uses of phosphogypsum. In fact, much research would likely involve wet chemistry, which will significantly reduce radon-222 emissions compared to other handling activities.

Comment 2.e: Three respondents stated that the requirement for an owner/operator of a phosphogypsum stack to sample the phosphogypsum to be released for research and development uses should be removed. It is not needed, as there is no limitation on the radium content of phosphogypsum used for research and development, and in any case, researchers will determine the radium content. Eliminating the certification requirement would result in most research and development facilities maintaining a lower phosphogypsum inventory, since it would be easier to replace the phosphogypsum consumed in research activities. Two other respondents stated the opposite: that the requirement for stack owners/operators to analyze the radium content of the phosphogypsum they release should not be eliminated, due to the potential risk of cancer and the potential mixing of phosphogypsum from different stacks for research and development. The cost to analyze phosphogypsum has been cited as about $200 per 55-gallon drum, which is insignificant. (FIPR, TFI, Florida Phosphate Council; ManaSota-88, Sheppard)

Response: The Agency supports research and development that may derive benefits from the utilization of phosphogypsum, so long as this research can be carried out safely. The risk analysis demonstrates that the risk from storing and using 7,000 pounds of phosphogypsum in a laboratory is safe, with an ample margin of safety. EPA has not sought to limit laboratory use of phosphogypsum with higher radium levels, and the EPA risk assessment assumes that phosphogypsum used in a laboratory setting will contain higher activity levels. Therefore, the current requirement that the radium-226 content in the phosphogypsum used in research and development be measured serves no useful purpose and has been removed from the rule.

Comment 2.f: While a greenhouse may be regarded as a laboratory for legal and policy purposes, raising the issue of EPA's authority to regulate the air inside the greenhouse, the fact that air exchanges in greenhouses are substantially higher than those in laboratories located in permanent structures and the fact that researchers generally spend much less time in greenhouses than at bench-scale work in laboratories both significantly reduce potential exposures for researchers. In addition, the assumption of two air changes per hour in a laboratory using 7,000 pounds of 26 pCi/g phosphogypsum is likely to be incorrect by a factor of 400 to 500 percent, given the OSHA recommendation of 4 to 12 air changes per hour, and a 1995 study that shows that the typical number of air changes in laboratories is at the high end in the range of I to 10 air changes per hour. Based on the OSHA recommendation alone, EPA's assumption of two changes per hour is low by at least 100 percent. (TFI, Gidry, Simplot)

Response: The Agency recognizes that greenhouses may have more air changes per hour than laboratories and that researchers may spend fewer hours in greenhouses. However, the Agency is promulgating a rule that applies to all indoor research and development activities involving

phosphogypsum. It is Agency policy to select parametric values that are reasonable in evaluating risk.

Comment 2.g: The risk analysis allowing the use of 7,000 pounds of phosphogypsum is based on a ventilation rate of two air changes per hour to remove radon and a gamma exposure based on an average level of shielding and proximity of a researcher to the phosphogypsum. These two types of exposure can be varied to allow more phosphogypsum to be used, since the level of radioactivity in the phosphogypsum should determine the ventilation rate and the shield thickness required. For example, using the equation given in the risk assessment for the steady-state radon concentration of radon in laboratory air, the area of exposed phosphogypsum allowed in a laboratory can be calculated for a given ventilation rate and radium concentration. A greater ventilation rate would be needed for phosphogypsum containing more radium or for a greater exposed area. A similar analysis holds for gamma exposure and the amount of shielding needed. The regulation should indicate the maximum radon concentration and the maximum gamma emission, rather than a specific amount and concentration. (Simplot)

Response: The proposed regulatory approach described in Comment 2.g. would be considerably more difficult and burdensome to implement than the rule promulgated by the Agency in 1992, and being revised today. In addition to requiring data on the radium-226 content of the phosphogypsum, it would require detailed evaluation of ventilation rates, shielding, and exposure geometries. By contrast, the limitation on the quantity within a facility simply requires the facility to limit its inventory.

Comment 2.h: EPA's analysis overestimates the risk to phosphogypsum researchers because it was not conducted in accordance with the recommendation of the ICRP that potential doses be multiplied by their probability of occurrence. All of EPA's exposure assumptions are treated as though they will occur. Distribution data can be used to estimate the probability of occurrence for the parameters assumed. (Gidry)

Response: The Agency is familiar with the recommendations of the ICRP and other advisory groups. However, EPA's NESHAPs, such as Subpart R, are based on the exposure to the maximally exposed individual, in conformance with the provisions of the *Vinyl Chloride* decision, using the framework of the Benzene NESHAP. In doing this, the EPA ensures that the NESHAPs protect the health of even the most exposed individual regardless of the likelihood of that individual's becoming exposed.

Comment 2.i: EPA's multi-laboratory geometry, used for exposure calculations in the risk assessment, is highly improbable, and assumes no credit for shielding from walls or floors. This risk assessment is highly conservative, and EPA finds the risk to be acceptable, so more realistic conditions should provide an even greater "ample margin of safety." (Chambers)

Response: The Agency believes that its risk analysis meets the needs of estimating the maximum individual risk in a multi-laboratory setting.

Comment 2.j: In 1992, EPA determined that the presumptively safe level is a maximum individual risk of 1×10^{-4}. It also removed the blanket prohibition on research and development activities. The Agency concluded that those conditions would protect public health with an ample margin of safety. Thus, EPA has already found that where the risk from phosphogypsum research and development is less than 1×10^{-4}, there is an ample margin of safety. The only thing that changed between 1992 and 1996 is that EPA found its risk assessment was flawed and severely understated the amount of phosphogypsum associated with that presumptively safe risk level. EPA should therefore increase the limit of phosphogypsum that can be used in research and development, consistent with the corrected risk assessment findings. (TFI)

Response: EPA agrees and has done so with this rulemaking.

Comment 2.k: EPA's assumption that a researcher spends 1,000 hours per year (about 4 hours per working day) at an average distance of 1 meter from a drum of phosphogypsum is too conservative. A researcher typically spends only a few hours per week at a distance of 1 meter and the remainder of the approximately 20 hours per week at a much greater distance. The assumed phosphogypsum-contaminated air dust concentration of 100 micrograms per cubic meter is also unreasonably conservative, as this degree of concentration could only occur (if it occurs at all) when the phosphogypsum was being sampled or otherwise disturbed. (TFI)

Response: The Agency's choice of exposure parameters and scenarios is consistent with its policy to set standards which protect the health of the maximally exposed individual.

Comment 2.l: The assumption that researchers using phosphogypsum are exposed for only 10 years is not supported by the record. Exposure times may be much longer. (ManaSota-88)

Response: The Agency agrees that no typical exposure period can be determined from the available information and that some workers might incur exposures over a period longer than 10 years. However, the Agency believes that using an exposure time of 10 years is reasonable, given the values assigned to other exposure parameters (hours per day, distance from the source, etc.) that affect the risk estimate.

Comment 2.m: Any radon build-up in a closed drum typically occurs within the first two weeks, with longer storage having no significant effect since radon build-up is limited by equilibrium. Radon will be distributed through the pore spaces of the phosphogypsum, rather than build up on top of the phosphogypsum in the barrel. There would probably be only a slight increase in radon over that released from an open drum. There would be no gamma radiation problem because the drum would act as shielding. In addition, EPA's assumption that research and development drums of phosphogypsum are open would allow the water to evaporate, which would foreclose effective research. A closed drum provides significant shielding from gamma radiation. (TFI, Scott, Simplot)

Response: The Agency agrees that equilibrium in an undisturbed drum will be reached within a

few weeks, with the radon distributed in the pore spaces of the phosphogypsum. However, the Agency does not agree that it should ignore the possibility of an open drum over long periods of time simply because some research plans would be impractical if the material were allowed to dry out. Finally, the Agency's estimates of the gamma exposure do take into account the geometry of the storage drum and the shielding that it would provide.

3. Use Outside a Laboratory Setting

Comment 3.a: The statement in Section 61.206(c), that proposed phosphogypsum use or distribution must protect public health to the same degree as disposal in a stack or mine is a test for determining a safe or acceptable level, not for establishing an ample margin of safety, as required under Clean Air Act Section 112. Ample margin is to be determined on a case-by-case basis, considering alternatives to the proposed use or distribution, so the ample margin provided by disposal in stacks or mines cannot be transferred to another use. Placing field research under Section 206, without providing evaluation criteria for field research projects, creates an invalid rule. (ManaSota-88)

Response: This rulemaking is limited to the reconsideration of the amount of phosphogypsum that can be used for research and development and to correct the formula used to demonstrate that phosphogypsum removed from a stack for agricultural purposes meets the 10 pCi/g limit. This comment addresses an issue of the 1992 rulemaking itself, which is not under reconsideration here. EPA is now developing a document laying out the procedures for applying for an alternative use application.

Comment 3.b: It is not correct that Section 61.205 provides the exclusive basis for authorized research and development activities, as contended at the hearing. This position would preclude EPA from approving a project where the risk was shown to be much smaller than 1×10^{-4}, clearly not the intended result, as EPA has stated in Section 61.206. Section 61.205 provides the generic prescribed conditions under which EPA has determined that phosphogypsum can be used with an ample margin of safety. Those generic conditions cannot preclude other research and development uses that can also be conducted with an ample margin of safety. (TFI)

Response: Section 61.205 is revised to confirm the intent of EPA that it apply only to indoor laboratory research and development. Outdoor uses of phosphogypsum must comply with either Section 61.204, "Distribution and use of phosphogypsum for outdoor agricultural purposes" or Section 61.206, "Distribution and use of phosphogypsum for other purposes." Section 21.206 allows EPA to authorize, on a case-by-case basis, indoor and outdoor uses not covered or authorized by Sections 61.204 and 61.205. Phosphogypsum that remains in outdoor stacks must comply with the numerical limits of Section 61.202.

Comment 3.c: Unlimited amounts of phosphogypsum can be used for agricultural purposes if the radium content does not exceed 10 pCi/g. The limitation on field research should be the same. Even at a higher radium content, 7,000 pounds of phosphogypsum should be allowed at any one

field site, since a reasonable rate of application would limit the size of controlled test fields to a relatively small number of acres. Controlled field studies contribute very little radon in excess of background levels, and these slightly increased levels are insignificant compared to the indoor standard of 0.02 Working Levels. Stack sampling data indicate no excess risk from radon due to working on or very near a phosphogypsum stack (0.01 WL averaged across all four boundaries of the stack), so there should be no radon danger from field studies, because the phosphogypsum concentration would be reduced by the physical process of land application. Further, deed restrictions or other forms of notice could be used to control later access if significant amounts of phosphogypsum are left in place after a field study is completed. (FIPR, TFI)

Response: The 10 pCi/g restriction on the radium-226 content of phosphogypsum used in agriculture was based on representative application rates and tillage practices in the U.S. This limit applies to agricultural field uses, including those field uses which are for the purpose of agricultural research and development. Research utilizing phosphogypsum containing more than 10 pCi/g can be approved on a case-by-case basis under Section 61.206. The efficacy of deed restrictions or other forms of notice in limiting potential risks can be considered in the context of individual applications which propose them.

Comment 3.d: EPA's proposal to allow unrestricted agricultural application of 10 pCi/g phosphogypsum, based on an annual application over 100 years, could be made even more flexible by allowing similar applications of phosphogypsum with higher radium levels over a shorter time. This should not change the risk significantly, if EPA would set a maximum amount of phosphogypsum (perhaps 400 pounds per acre) that could be applied over the period of an agricultural research and development program. Evaluating requests following this pattern could be approved more quickly and help simplify and reduce paperwork. (FIPR)

Response: EPA agrees that the risk assessment model used in deriving the 10 pCi/g limit for agricultural applications of phosphogypsum under Section 204 could be used to determine alternative radium-226 concentrations, application rates, and time periods of usage for phosphogypsum that would meet an acceptable risk. In cases where there are applications dealing with similar alternative uses, the Agency is prepared to streamline its approval process under Section 206 to reduce the burden on applicants, provided their data demonstrate the projects meet the 1×10^{-4} risk criteria.

Comment 3.e: Studies of radium uptake by plants would be severely constrained by a 700-pound limitation, as a laboratory study showed no difference in radium uptake between rice plants grown in a control medium and in phosphogypsum; this should be examined on a larger scale. Data from plants growing on phosphogypsum stacks also often show little or no difference from those grown in a control medium; however, the numbers of samples are too small to properly assess those results. Water hyacinths do show an increased radium uptake when grown in water with phosphogypsum. However, for perspective, a person consuming a typical diet receives a dose of about 1.5 mrem/yr. If consuming milk and meat from cattle grazing on a phosphogypsum test

plot, the annual total additional dose would be 0.15 mrem. For vegetables such as radishes and kale, the additional dose would be about 0.18 mrem/yr. (Scott)

Response: This rulemaking is limited to the reconsideration of the amount of phosphogypsum that can be used for research and development and to correct the formula used to demonstrate that phosphogypsum removed from a stack for agricultural purposes meets the 10 pCi/g limit. This comment addresses the 1992 rulemaking itself, which is not under reconsideration here. In any case, the limit on the radium content of phosphogypsum used in agriculture is based on risks associated with subsequent occupancy of treated land, not on any hypothetical dietary exposures. The limit on indoor research and development is being increased to 7,000 pounds with this rulemaking.

Comment 3.f: With no limit on the quantity of phosphogypsum that can be used in field studies (the research and development limit does not apply), any such study must be specifically approved by EPA. This currently requires the applicant to provide a full risk assessment acceptable to the agency. EPA has not provided: 1) guidance on the content of the required risk assessment, 2) a consistent approach and standards for approval of field study requests by regional offices, and 3) a defined time period for EPA review of risk assessments and applications. This situation is unduly burdensome to industry. The individual approval regulatory scheme that applies to phosphogypsum field studies is therefore arbitrary and capricious. If EPA continues to require individual approval for phosphogypsum field studies, it must develop protocols for seeking and granting those approvals, taking into account two main issues. First, the protocols should include a "tiering" process, under which smaller, more limited field studies can be approved on the basis of a screening analysis rather than a complete risk assessment. Second, field studies that are the same or similar to those already approved after a full risk assessment should not have to duplicate that risk assessment: the subsequent studies should be required only to address the relevant differences between the projects. Further, field studies that do not result in permanent installations should not be required to provide a formal risk assessment. (TFI, Seals, Florida Phosphate Council)

Response: This rulemaking is limited to the reconsideration of the amount of phosphogypsum that can be used for research and development and to correct the formula used to demonstrate that phosphogypsum removed from a stack for agricultural purposes meets the 10 pCi/g limit. This comment addresses the 1992 rulemaking itself, which is not under reconsideration here. These issues were considered in the 1992 rulemaking and the Agency determined that the use of phosphogypsum in agriculture and for research and development, under the limitations imposed on its use, is safe. The Agency also provided for alternative use of phosphogypsum under the provisions of Section 61.206, where Agency approval is required for its use. Any applicant is required to demonstrate that the alternative use meets EPA's risk requirements before the use can be approved. The Agency shares the commenters' view that wherever possible, the application process and review should be streamlined. Existing models and other precedents will be allowed wherever appropriate to eliminate redundancy and unnecessary steps for applicants and EPA. In response to specific issues raised in this comment: 1) EPA has been and will continue to be

available to offer guidance to applicants and is developing comprehensive written guidance; (2) All alternative use applications are approved at the EPA headquarters level, not at the regional level, which assures that all applicants under Section 61.206 are evaluated in a consistent manner; (3) Given the uniqueness of each application, EPA cannot commit to a predetermined review period. However, as stated above, where there are acceptable precedents, EPA will allow them as part of an application.

Comment 3.g: Public health will not be protected if more field projects are allowed. Using phosphogypsum as roadbed material and for agricultural purposes will contaminate soil, groundwater, air, and vegetation as radium-226 is leached by traffic, flooding, rain, and other weather conditions. Using phosphogypsum as landfill cover and to enhance waste decomposition will contaminate the site for future use and expose landfill workers and the public to excess cancer risk. This use will also contaminate ground and surface waters, as all landfills, lined or unlined, eventually leak. Using phosphogypsum to make reefs in offshore waters is equivalent to dumping; phosphorus will harm aquatic ecosystems, accumulate radionuclides and heavy metals, and eventually enter the food chain through benthic feeders. Future use of land areas would have to be restricted for thousands of years to protect public health. Deed restrictions for using phosphogypsum in projects such as these are meaningless when used to secure an EPA exemption for that use, because the applicant admits that phosphogypsum is harmful by agreeing to a deed restriction. However, any deeds to lands that have been treated with phosphogypsum should still state that fact. (ManaSota-88, Sheppard)

Response: This rulemaking is limited to the reconsideration of the amount of phosphogypsum that can be used for research and development and to correct the formula used to demonstrate that phosphogypsum removed from a stack for agricultural purposes meets the 10 pCi/g limit. This comment addresses the 1992 rulemaking itself, which is not under reconsideration here. These issues were considered in the 1992 rulemaking and the Agency determined that the use of phosphogypsum in agriculture and for research and development, under the limitations imposed on its use, is safe, with an ample margin of safety. The Agency also provided for alternative use of phosphogypsum under the provisions of Section 61.206, where Agency approval is required for its use. Any applicant is required to demonstrate that the alternative use meets EPA's risk requirements before the use can be approved.

Comment 3.h: Use of phosphogypsum in roadbeds will contaminate soil, groundwater, air, and vegetation by leaching, flooding, and traffic wear. Monitoring wells adjacent to a road constructed with phosphogypsum have shown elevated radionuclide levels. (ManaSota-88)

Response: This rulemaking is limited to the reconsideration of the amount of phosphogypsum that can be used for research and development and to correct the formula used to demonstrate that phosphogypsum removed from a stack for agricultural purposes meets the 10 pCi/g limit. This comment addresses the 1992 rulemaking itself, which is not under reconsideration here. Any use of phosphogypsum for roadbed use would have to be approved under Section 61.206. Such

use would be approved only if the applicant demonstrates that the requirements of Section 61.206 are satisfied.

4. Sampling Statistics

Comment 4.a: The rules requiring sampling across the area of the stack to be moved into commerce need to be better defined, as the sampling requirements are burdensome and expensive. The proposed requirements leave open several questions, such as:

- do underlying strata have to be sampled?
- will EPA require a new sampling program for each new stratum?
- does each shipment from a stratum have to be analyzed? (Simplot)

Response: No sampling is required for phosphogypsum removed from the stack for use in research and development. For all other cases, the surface of the area from which phosphogypsum is to be remove must be sampled once a year. The underlying strata do not need to be sampled. The same sampling protocol must be used each time the surface of the area from which the phosphogypsum is to be removed is sampled, that is a minimum of 30 samples must be taken each time the area is sampled. Individual shipments do not need to be sampled provided they have been removed from the area of the stack that was sampled and found to be less that 10 pCi/g by the procedures outlined in the rule and described in the document "Statistical Procedures for Certifying Phosphogypsum for Entry into Commerce, as Required by Section 61.207 of 40 CFR Part 61, Subpart R" and provided that this sampling was performed no longer than one year proceeding its removal.

Comment 4.b: According to the rule, apparently every stratum of phosphogypsum that might be moved off the site must be sampled, with the number of samples to be determined by how close the phosphogypsum is to the average radium-226 concentration of 10 pCi/g. The error bound of the samples must be no more than 0.05. The explanation section of "Statistical Procedures for Certifying..." assumes that the standard deviation among samples is 8.2 pCi/g. This equation indicates that the closer to 10 pCi/g the radium-226 concentration of the phosphogypsum, the required number of samples and thus the testing expenses increase rapidly, due to the stringent error bound of 0.05. A regulation stating a total exposure limit based on the product of radium concentration and area could solve this sampling problem. Regulations should require the same knowledge of the error distribution of radium concentrations without regard to the actual concentration, to allow the company to design their operation based on that knowledge, again taking concentration and area into account. (Simplot)

Response: The test does not require that every stratum of the phosphogypsum in a stack be sampled. It requires that the surface of the area from which phosphogypsum is to be removed must be sampled annually. A minimum of 30 samples is needed in all cases. The number of samples needed does increase as the true radium-226 concentration approaches 10 pCi/g. This is a characteristic of the statistics underlying hypothesis testing. As stated in the rule, this situation,

where the required sample size may be quite large, may cause the cost of sampling to increase to the point that a stack operator may abandon the attempt to certify this area of the stack for the removal of phosphogypsum. The standard deviation of 8.2 pCi/g used in the Appendix to "Statistical Procedures for Certifying Phosphogypsum for Entry into Commerce, as Required by Section 61.207 of 40 CFR Part 61, Subpart R" was for illustration only, although it was chosen to be representative of values likely to be encountered in these types of tests. It was not intended to represent a true case. Note that both the mean and standard deviation enter into the determination of the critical value, which is needed for certification of an area of a stack for removal of phosphogypsum.

Comment 4.c: Since phosphogypsum has a low radioactivity content and the accuracy of laboratory equipment is not perfect, the way radiation is released (in bursts, not continuously) may lead to overestimating the radium content of a sample of phosphogypsum. EPA should clarify the equations used for determining the radium-226 concentration of a phosphogypsum stack, and revise the methods for determining the sample size and testing needed to demonstrate that the radium concentration is less than 10 pCi/g. However, EPA has assumed that the number of disintegrations from a 10 g portion of a 10 pCi sample is enough to justify the assumed transitions from the mathematically correct binomial distribution the to approximate and thus somewhat less accurate Gaussian statistics used in the draft of "Statistical Procedures ... ." A binomial distribution is more appropriate for testing purposes, rather than a Gaussian distribution, as it measures both mean and variance, and is the appropriate expression for radioactivity release. A rule should be based on full mathematical rigor. The NESHAP should be revised to permit a statistical analysis based on either a binomial or Gaussian distribution. (TFI, Simplot)

Response: This comment confuses two separate steps that must be undertaken in characterizing the radium-226 content of phosphogypsum. The first step to is determine the radium-226 content of each sample removed from the stack. This requires the use of counting statistics, based on the Poisson distribution. A separate analysis (or count) must be performed on each sample to determine its radium-226 concentration. The required procedures are described in Part 61, Appendix B, Method 114. The techniques described there are standard laboratory procedures for measuring the levels of radioactivity in samples. Once the radium-226 concentrations of each of the samples has been determined, the procedures outlined in the revised Section 61.207 of Subpart R, promulgated with this rulemaking, are used in performing the second step, where the average radium-226 concentration of the phosphogypsum in the area of the stack is determined. The second step does not rely on the procedures of Method 114. Instead the statistics outlined in Section 61.207, and discussed in the document "Statistical Procedures for Certifying Phosphogypsum for Entry into Commerce, as Required by Section 61.207 of 40 CFR Part 61, Subpart R" are appropriate.

For example, in a case where 30 samples of phosphogypsum had been removed from a stack for analysis, the procedures used in Method 114 would be used to determine the radium-226 concentrations in each of the 30 samples. After these 30 concentrations had been determined, the radium-226 concentration in the area of the stack from which phosphogypsum is to be removed

would then be determined following the procedures outlined in Section 61.207 and discussed in the document "Statistical Procedures for Certifying Phosphogypsum for Entry into Commerce, as Required by Section 61.207 of 40 CFR Part 61, Subpart R." The procedures outlined there are based on the normal (or Gaussian) distribution. As discussed in the Appendix of this document, there is good theoretical justification for the use of this distribution

Comment 4.d: For the sampling protocol, EPA should consider a method that would take known characteristics of a particular phosphogypsum source into account and allow the mean value of a certain number of samples to be used as a qualifying limit, since the risk associated with radium content does not vary that much within a few pCi/g of EPA's limit of 10 pCi/g. The closer the radium content is to 10 pCi/g, the more samples are required to determine the actual radium content within EPA's error band, and there will always be a risk of misclassification. (Chambers)

Response: The test that the Agency is requiring for demonstrating that the phosphogypsum which is to be removed from a stack is no greater than 10 pCi/g is based on the standard statistical test of hypotheses. The test is conservative. It is structured in such a way that strong evidence is required in demonstrating that the true concentration is less than 10 pCi/g. In cases where the true mean is less than 10 pCi/g, the closer the true mean is to 10 pCi/g, the more demanding the evidence required (i.e. the larger the sample needed to demonstrate compliance). This is appropriate, because the Agency's concern is the risk posed by the use (or misuse) of phosphogypsum.

Comment 4.f: The value of 0.05 in the proposed rule is the probability that sampling the stratum of phosphogypsum entering commerce shows that it is safe to distribute/transport the phosphogypsum when it is not in fact safe to do so - that is, when the true sampling value exceeds 10 pCi/g. This type of analysis will result in phosphogypsum being rejected for use when it should be accepted. This false rejection rate could be excessively high, depending on the mean radium content of the phosphogypsum. The revised rule should adopt a balance between allowable Type I and Type II errors. (Simplot)

Response: There is always a chance of occurrence a Type I or a Type II error in tests of statistical hypotheses, such as the test required by Section 61.207. The chance of error is inherent in all tests of hypotheses. In structuring these tests, there is a tradeoff in the chances of Type I and Type II errors. Given no change in the sample size, the consequence of reducing the chance of occurrence of a Type I error is to increase the chance of occurrence of a.Type II error. Similarly, an attempt to reduce the chance of a Type II error will result in an increase in the chance of a Type I error. An increase in the sample size, with no other changes in the test, is the only way to simultaneously reduce the chance of occurrence of both the Type I and Type II errors. The Agency's choice of a .05 probability of occurrence of a Type I error is predicated on the need to protect the general public from the risk of radiation exposure.